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The authority for the indexing vocabulary used in the subject index of this issue of *STAR* is the *NASA Thesaurus*. The most recent version is the *NASA Thesaurus—Alphabetical Update* (NASA SP-7040), September 1971, which is available from NTIS as accession number N72-15923 for $6.00 in paper copy. The current cross-reference structuring for each term appears in this volume, together with additional approved terms that may be used in indexing documents announced in other issues of *STAR*. NASA SP-7040 supersedes the first two volumes (subject terms A–Z) of the three-volume *Preliminary Edition of the NASA Thesaurus* (NASA SP-7030), December 1967. Volume III of the Preliminary Edition presented the following aids to vocabulary selection of the 1967 terms: hierarchical display of index terms, category terms listing, and permuted index; this has not been updated but may still be useful.

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31 Space Vehicles 1604
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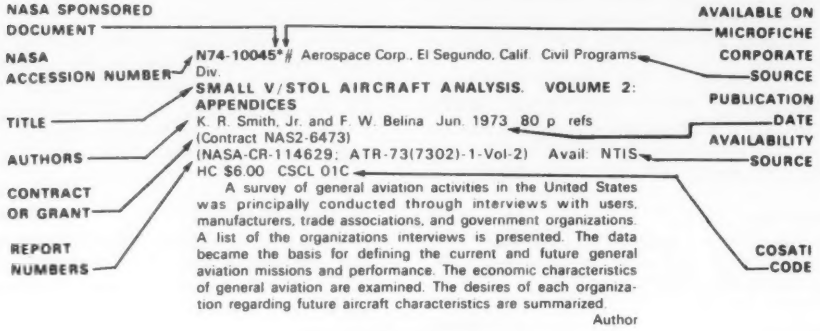
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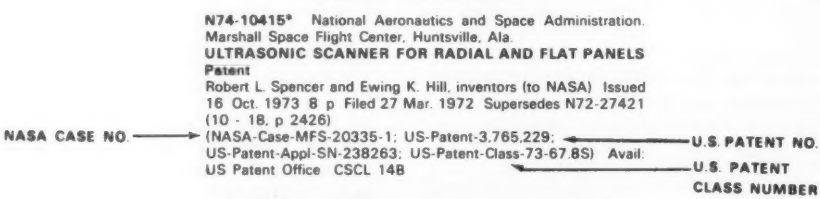
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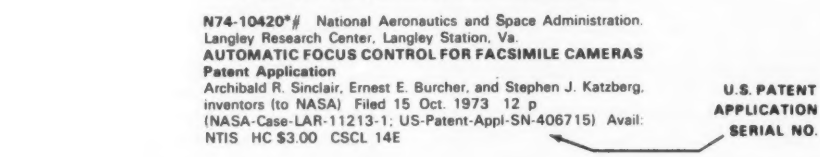
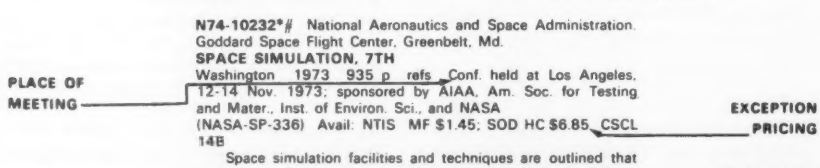
Patent
Robert L. Spencer and Ewing K. Hill, inventors (to NASA) Issued 16 Oct. 1973 8 p Filed 27 Mar. 1972 Supersedes N72-27421 (10 - 18, p 2426)
(NASA-Case-MFS-20335-1; US-Patent-3,765,229; US-Patent-Appl-SN-238263; US-Patent-Class-73-67.8S) Avail: US Patent Office CSCL 14B

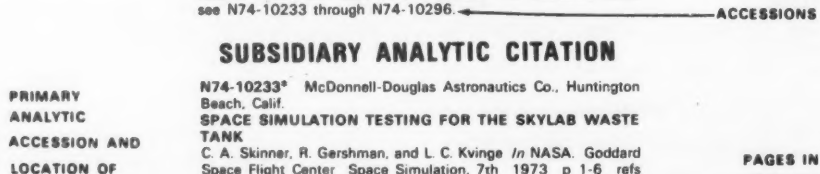
PATENT APPLICATION CITATION


U.S. PATENT APPLICATION SERIAL NO.
N74-10420*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATIC FOCUS CONTROL FOR FACSIMILE CAMERAS
Patent Application
Archibald R. Sinclair, Ernest E. Burcher, and Stephen J. Katzberg, inventors (to NASA) Filed 15 Oct. 1973 12 p
(NASA-Case-LAR-11213-1; US-Patent-Appl-SN-406715) Avail: NTIS HC $3.00 CSCL 14E

PRIMARY ANALYTIC CITATION AND ABSTRACT


PLACE OF MEETING
EXCEPTION PRICING
SUBSIDIARY ANALYTIC ACCESSIONS
N74-10232*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACE SIMULATION, 7TH
Washington 1973 935 p refs Conf. held at Los Angeles, 12-14 Nov. 1973; sponsored by AIAA, Am. Soc. for Testing and Mater., Inst. of Environ. Sci., and NASA
(NASA-SP-336) Avail: NTIS MF $1.45; SOD HC $6.85 CSCL 14B
Space simulation facilities and techniques are outlined that encompass thermal scale modeling, computerized simulations, reentry materials, spacecraft contamination, solar simulation, vacuum tests, and heat transfer studies. For individual titles, see N74-10233 through N74-10296.

SUBSIDIARY ANALYTIC CITATION


PRIMARY ANALYTIC ACCESSION AND LOCATION OF FULL CITATION AND ABSTRACT
PAGES IN PRIMARY REPORT
N74-10233* McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE SIMULATION TESTING FOR THE SKYLAB WASTE TANK
C. A. Skinner, R. Gershman, and L. C. Kvinge *In* NASA. Goddard Space Flight Center Space Simulation, 7th 1973 p 1-6 refs
(For availability see N74-10232 01-11)
CSCL 14B

VOLUME 12 NUMBER 13 / JULY 8, 1974

Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-21630* + National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 39
Jan. 1974 131 p refs
(NASA-SP-7037(39)) Avail: NTIS HC $4.00 CSCL 01A

This special bibliography lists 417 reports, articles, and other documents introduced into the NASA scientific and technical information system in December 1973. Author

N74-21631*# Kanner (Leo) Associates, Redwood City, Calif.
PROCESS AND DEVICE FOR ADAPTATION OF SHARP LEADING EDGE AIRFOILS TO ANY SPEED, SUBSONIC OR SUPERSONIC
Washington NASA Apr. 1974 27 p Transl. into ENGLISH from French Patent no. 1071234 (19 Nov. 1952)
(Contract NASw-2481)
(NASA-TT-F-15569) Avail: NTIS HC $4.50 CSCL 01A

The invention of a method for changing the configuration of sharp leading edge airfoils during flight to maximize their efficiency in any speed range is described. The primary mechanism used is a deflecting or slotted flap with sharp leading edge which can be used in aircraft wings, stabilizers, or air intakes. Deflection of the flap brings the airflow into a position tangential to the edge and the shock wave strikes the edge itself or the area of its immediate vicinity. Pressure measurement devices enable the pilot or an automatic control system to make the proper change in the deflection of the flap as a function of the speed of the aircraft. Author

N74-21632*# Scientific Translation Service, Santa Barbara, Calif.
NUMERICAL INVESTIGATION OF VORTEX SHEETS ISSUING FROM A SEPARATION LINE NEAR THE LEADING EDGE
Colmar Rehbach Washington NASA Apr. 1974 17 p refs Transl. into ENGLISH from Rech. Aerosp. (France), Nov. - Dec. 1973 p 325-330
(Contract NASw-2483)
(NASA-TT-F-15530; A74-18289) Avail: NTIS HC $4.00 CSCL 01A

The formation of a vortex sheet along a line near the leading edge of slender delta wings is analyzed. An iterative calculation method is proposed which is based on the substitution of the vortex sheet representing the wing and its trailing sheet by a network of concentrated line vortices. The method is limited to plane delta wings. Results of the numerical method are compared with data obtained in a water tunnel. Author

N74-21633*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
AN ANALYTICAL INVESTIGATION OF WING-JET INTERACTION
Edward C. Lan Apr. 1914 136 p refs
(Grant NGR-17-002-107)
(NASA-CR-138140; CRINC-FRL-74-001) Avail: NTIS HC $10.00 CSCL 01A

The aerodynamic interaction between the wing and an inviscid jet with Mach number nonuniformity is formulated by using a two-vortex-sheet model for the jet. One of the vortex sheets accounts for the induced jet flow and the other the induced outer flow. No additional source distribution is needed for the jet at an angle of attack. The above problem is solved by satisfying the jet and wing tangency and the jet pressure-continuity conditions and using a quasi vortex lattice method for computing the induced flow field. The latter method is derived through theoretical consideration by properly accounting for singularities present in the equations and possesses the same simplicity and generality as the conventional vortex lattice method but has a better rate of numerical convergence. The resulting system of algebraic equations is solved by Purcell's vector method. The numerical formulation is first applied to the wing-slipstream interaction problem. Results for one centered-jet configuration are compared with those predicted by some existing theories. Author

N74-21634*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOW SPEED AERODYNAMIC CHARACTERISTICS OF NACA 6716 AND NACA 4416 AIRFOILS WITH 35 PERCENT-CHORD SINGLE-SLOTTED FLAPS
Gene J. Bingham and Kevin W. Noonan Washington May 1974 52 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Hampton, Va.
(NASA-TM-X-2623; L-8410) Avail: NTIS HC $3.75 CSCL 01A

An investigation was conducted in a low-turbulence pressure tunnel to determine the two-dimensional lift and pitching-moment characteristics of an NACA 6716 and an NACA 4416 airfoil with 35-percent-chord single-slotted flaps. Both models were tested with flaps deflected from 0 deg to 45 deg, at angles of attack from minus 6 deg to several degrees past stall, at Reynolds numbers from 3.0 million to 13.8 million, and primarily at a Mach number of 0.23. Tests were also made to determine the effect of several slot entry shapes on performance. Author

N74-21635*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ON THE USE OF THICK-AIRFOIL THEORY TO DESIGN AIRFOIL FAMILIES IN WHICH THICKNESS AND LIFT ARE VARIED INDEPENDENTLY
Raymond L. Barger Washington May 1974 15 p refs
(NASA-TN-D-7579; L-9350) Avail: NTIS HC $3.00 CSCL 01A

A method has been developed for designing families of airfoils in which the members of a family have the same basic type of pressure distribution but vary in thickness ratio or lift, or both.

Thickness ratio and lift may be prescribed independently. The method which is based on the Theodorsen thick-airfoil theory permits moderate variations from the basic shape on which the family is based. Author

N74-21636# Aeronautical Research Labs., Melbourne (Australia).
A PRELIMINARY TOWING TANK STUDY OF THE TRAILING VORTEX GENERATED BY A RECTANGULAR WING, INCLUDING THE EFFECTS OF SEVERAL TIP MODIFICATIONS
D. H. Thompson Sep. 1973 42 p refs
(ARL/A-Note-342) Avail: NTIS HC $5.25 CSCL 01A

The structure of the trailing vortex generated by a rectangular wing in a small towing tank has been studied using the hydrogen bubble flow visualization technique. The effects on the vortex of starting and stopping the towing carriage and of passing a body through the vortex core have been examined. A total of fourteen modifications to the basic wing have been tested for the effect of each on the trailing vortex. Those modifications which most altered the vortex structure were a spoiler on the wing upper surface at the tip, a circular end plate and a perforated tip extension. Author

N74-21637# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
DETERMINATION OF THE ALLOWABLE TOLERANCES FOR THE ASYMMETRIES OF A FREE ROLLING VEHICLE
A. Kirszenblat Aug. 1973 31 p refs
(TAE-185) Avail: NTIS HC $4.75

A method for determining tolerances on free rolling missile asymmetries is presented. Practical flight limitations, such as a specified maximum lateral aerodynamic load, are taken into account. The proposed method can deal with missile dynamics described by differential equations of motion. It is demonstrated for the case of a vehicle having a lateral center-of-gravity and aerodynamic asymmetries. The vehicle tolerance contour with the mass asymmetry as an independent variable is calculated by an optimal parameter search combining the gradient projection technique and the continuation method. For this search, the maximum value of the lateral load and its partial derivatives with respect to the asymmetry parameters must be known. They are obtained by integrating numerically the differential equations of motion and the related sensitivity equations. The method is applied to a numerical example. Author

N74-21638*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBINED QUADRUPOLE-DIPOLE MODEL FOR INLET FLOW DISTORTION NOISE FROM A SUBSONIC FAN
Marvin E. Goldstein, James H. Dittmar, and Thomas F. Gelder Washington May 1974 48 p refs
(NASA-TN-D-7676; E-7881) Avail: NTIS CSCL 20D

A combined quadrupole-dipole model has been developed for the noise generated by inlet flow distortion in a subsonic fan. A formula is derived for the total upstream-radiated acoustic power in each tone as a function of the design parameters of the fan and the properties of the inlet flow distortion. Numerical results are obtained for values of the parameters corresponding to various quiet fans. The analysis is compared with noise measurements taken on a 51-cm (20-in.) diameter research fan as well as with those taken on a number of full-scale fan stages. Fairly good agreement was obtained. It should therefore be possible to use this model to study the noise-reduction potential of the various fan design parameters. Author

N74-21639*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLIGHT REYNOLDS NUMBER EFFECTS ON A CONTOURED BOATTAIL NOZZLE AT SUBSONIC SPEEDS
Roger Chamberlin Washington May 1974 24 p refs
(NASA-TM-X-3053; E-7818) Avail: NTIS HC $3.00 CSCL 01A

A contoured boattail nozzle typical of those used on a twin-engine fighter was tested on an underwing nacelle mounted on an F-106B aircraft. The gas generator was a J85-GE-13 turbojet engine. The effects of Reynolds number, Mach number, and angle of attack on boattail drag and boattail pressure profiles were investigated. Increasing Reynolds number caused a slight reduction in boattail drag at both Mach 0.7 and 0.9. The nozzle had relatively low boattail drag even though the flow was separated over a large portion of the boattail. Author

N74-21640# Ballistic Research Labs., Aberdeen Proving Ground, Md.
WIND-TUNNEL TEST OF A SPINNING, LOW-DRAG PROJECTILE WITH CANTED BORE RIDERS AT MACH NUMBERS FROM 1.75 TO 2.5
Klaus O. Opalka Jan. 1974 76 p refs
(DA Proj. 1T3-62301-A-201)
(AD-774804; BRL-MR-2349) Avail: NTIS CSCL 19/1

Test data are reported for a spin-stabilized, low-drag projectile with and without bore riders mounted at various angles of cant with respect to the shell axis. Wind-tunnel tests were performed with and without spin at four Mach numbers evenly spaced from 1.75 to 2.5; some of the resulting aerodynamic coefficients are plotted versus spin rate, angle of attack or Mach number. Author (GRA)

N74-21641# Lockheed-Georgia Co., Marietta.
VALIDATION OF NEW GUST DESIGN PROCEDURES FOR MILITARY TRANSPORTS Final Report, 1 Mar. - 9 Nov. 1973
James J. Spitler Nov. 1973 115 p refs
(Contract F33615-73-C-3047; AF Proj. 1367)
(AD-775385; LG73ER0153; AFFDL-TR-73-118) Avail: NTIS CSCL 01/1

AFFDL-TR-70-106, Design Manual for Vertical Gust Based on Power Spectral Techniques, outlines four procedures for design of aircraft for vertical gusts. Validation of these new gust design procedures for military aircraft is provided by application of these procedures to four military transports. Lockheed models C-130, C-141A, C-140, C-130, and C-5A provide the means to evaluate design gust response for a range of gross weights from 20,000 to 750,000 pounds and encompass design features such as straight and swept wings, prop jets, fan jets, and turbo jets. The four design procedures, each successively more detailed, are applied for each aircraft evaluation even though they may not be required. In practice, the design manual allows analysis conclusion upon successful completion of the less detailed procedures. (Modified author abstract) GRA

N74-21642# West Virginia Univ., Morgantown. Dept. of Aerospace Engineering.
LIFTING SURFACE ANALYSIS USING CHORDWISE LOAD SEGMENTS
Subrato Chandra and John L. Loth Aug. 1973 77 p refs
(Contract N00014-68-A-0512; NR Proj. 215-163)
(AD-775336; TR-37) Avail: NTIS CSCL 01/1

Of the two techniques of subsonic lifting surface theory the kernel function approach is superior to the lattice discretization procedure for solving simple planar problems. But complex problems can be more effectively solved by the lattice procedure using modern computers. However, the results of lattice calculations are not entirely satisfactory and it is desirable to have a simpler kernel procedure capable of solving difficult problems. The present analysis attempts to establish a flexible kernel function procedure which is faster than the existing kernel function techniques and more accurate than the lattice methods. This is done by introducing a new chordwise function to be used in the kernel function procedure. The present function is comprised of linearly loaded chordwise segments with appropriate non linear loading segments for the leading and trailing edge. (Modified author abstract) GRA

N74-21643# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
HYPERSONIC VISCOUS-INVISCID INTERACTION WITH VECTORED SURFACE MASS TRANSFER
G. R. Inger and T. F. Swean 1974 27 p refs
(Grant AF-AFOSR-2173-72; AF Proj. 9781)
(AD-775098; AFOSR-74-0193TR) Avail: NTIS CSCL 01/1

A fundamental theoretical study of homogeneous vectored injection and suction in high speed flows with heat transfer and self-induced pressure gradients is described, based on local similarity solutions of the laminar boundary layer equations. The

results show the important effects of both injection velocity and vector angle on a variety of physical properties of practical interest such as velocity and temperature profiles, skin friction, heat transfer rate, displacement thickness and induced pressure field. In addition, the existence of a new set of solutions pertaining to upstream-vectored injection is established and investigated. Moreoever, it is shown that the frictional heating associated with the tangential injection velocity component can significantly influence the heat transfer characteristics of high speed flows. Author (GRA)

N74-21644# RAND Corp., Santa Monica, Calif.
THE FLOW OVER A POROUS BODY: A SINGULAR PERTURBATION PROBLEM WITH TWO PARAMETERS
K. Gersten and J. F. Gross. May 1973. 47 p. refs
(AD-775072; R-980-PR) Avail: NTIS CSCL 01/1

The proper design of high-speed aircraft depends to a large extent on the ability to predict the skin-friction and heat-transfer characteristics resulting from the interaction of the surface of the aircraft with the surrounding medium. At high speeds, viscous heating in the laminar boundary layer on the surface of the vehicle can cause elevated temperatures that result in loss of structural integrity or ablation of the surface. To alleviate this problem, a coolant can be injected through pores in the surface. Surface heating is reduced both by the action of the coolant and by the diminished heat transfer resulting from an increase in boundary-layer thickness. The report discusses the effects of injection or suction of material near the stagnation point of a porous body--the extreme forward point where the oncoming air is brought to rest and the boundary layer essentially begins. Emphasis is given to strong injection and suction problems. GRA

N74-21645# McDonnell-Douglas Corp., Long Beach, Calif.
ANALYTICAL STUDIES OF TWO-ELEMENT AIRFOIL SYSTEMS Interim Report, Feb. 1971 - Dec. 1973
Richard M. James. Feb. 1974. 277 p. refs
(Contract N00014-72-C-0218)
(AD-775538; MDC-J5831) Avail: NTIS CSCL 01/1

The report represents an interim stage of a research program sponsored by ONR to try and put the basic mathematics of design and flow analysis methods for two-element airfoil systems on an equivalent footing to that of single element configurations with the ultimate end in view of producing optimum designs. Techniques of conformal mapping and multiple image reflection are used to solve problems connected with two disjoint circles and then to develop the integral equations describing problems of real interest posed in a canonical domain -- the annular space between two concentric circles. Using this point of view, the essential character of a promising general technique is deduced. (Modified author abstract) GRA

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-21646*# Scientific Translation Service, Santa Barbara, Calif.
A METHOD FOR AVOIDING INSECT ROUGHNESS ON AIRCRAFT
F. X. Wortmann. Washington NASA Apr. 1974. 13 p. refs
Transl. into ENGLISH from Luftahrttechnik, Raumfahrttechnik (West Germany), v. 9, no. 9, Sep. 1963 p 272-274
(Contract NASw-2483)
(NASA-TT-F-15454) Avail: NTIS HC $4.00 CSCL 01C

Insect-induced roughness on aircraft can be avoided by highly elastic rubber coverings on wing and control surface leading edges. Film photographs have shown that such elastic surfaces can elastically reflect impacting insects or viscous liquid drops. This prevents the formation of insect roughness and the endangered fuselage and wing leading edges remain smooth. Author

N74-21647*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
AN INVESTIGATION OF SEPARATE SURFACE STABILITY AUGMENTATION SYSTEMS FOR GENERAL AVIATION AIRCRAFT Progress Report
Apr. 1974. 100 p. ref
(Grant NGR-17-002-095)
(NASA-CR-138120; PR-9) Avail: NTIS HC $8.00 CSCL 01C

The status of a project to develop and evaluate separate surface stability augmentation systems for general aviation aircraft is discussed. The electrical design, roll heading hold is described and schematic diagrams and an operational description are provided. The flight tests program is explained. Various failure conditions are proposed and the effects on the stability of the aircraft are analyzed. Author

N74-21648*# Oklahoma State Univ., Stillwater. School of Electrical Engineering.
OPTIMAL CONTROLLER DESIGN FOR HIGH PERFORMANCE AIRCRAFT UNDERGOING LARGE DISTURBANCE ANGLES Final Report
Ronald P. Rhoten. 28 Feb. 1974. 124 p.
(Grant NGR-37-002-096)
(NASA-CR-138130) Avail: NTIS HC $9.25 CSCL 01C

An examination of two aircraft controller structures applicable to on-line implementation was conducted. The two controllers, a linear regulator model follower and an inner-product model follower, were applied to the lateral dynamics of the F8-C aircraft. For the purposes of this research effort, the lateral dynamics of the F8-C aircraft were considered. The controller designs were evaluated for four flight conditions. Additionally, effects of pilot input, rapid variation of flight condition and control surface rate and magnitude deflection limits were considered. Author

N74-21649*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FREE-FLIGHT INVESTIGATION OF THE STABILITY AND CONTROL CHARACTERISTICS OF A STOL MODEL WITH AN EXTERNALLY BLOWN JET FLAP
Lysle P. Parlett, Sandy J. Emerling, and Arthur E. Phelps, III (Army Air Mobility R and D Lab., Hampton, Va.) Washington Apr. 1974. 84 p. refs
(NASA-TN-D-7411; L-9148) Avail: NTIS HC $4.00 CSCL 01B

The stability and control characteristics of a four-engine turbofan STOL transport model having an externally blown jet flap have been investigated by means of the flying-model technique in the Langley full-scale tunnel. The flight characteristics of the model were investigated under conditions of symmetric and asymmetric (one engine inoperative) thrust at lift coefficients up to 9.5 and 5.5, respectively. Static characteristics were studied by conventional power-on force tests over the flight-test angle-of-attack range including the stall. In addition to these tests, dynamic longitudinal and lateral stability calculations were performed for comparison with the flight-test results and for use in correlating the model results with STOL handling-qualities criteria. Author

N74-21650*# Kanner (Leo) Associates, Redwood City, Calif.
NEAR FIELD AND FAR FIELD SOUND RADIATION FROM Do 31 V/STOL JET TRANSPORT AND POSSIBILITIES FOR NOISE ABATEMENT IN FUTURE V/STOL DEVELOPMENT
Peter Bartels. Washington NASA Apr. 1974. 126 p. refs
Transl. into ENGLISH of "Schallabstrahlung im Nah- und Fernfeld des V/STOL Strahltransporters Do 31 und Laermminderumgsmoeglichkeiten bei Zukuenftigen VSTOL-Entwicklungen", Dornier-Werke G.m.b.H., Friedrichshafen, West Germany, BMVG-FBWT-72-23, 1972. 167 p
(Contract NASw-2481)
(NASA-TT-F-15534; BMVg-FBWT-72-23) Avail: NTIS HC $9.50 CSCL 01C

Theoretical and experimental near and far field noise studies on the Do 31 V/STOL jet transport aircraft are presented in updated form. Particular significance is also attached to the

reduction in noise which the Do 31 has already made possible at existent airports and the problems of noise and noise abatement associated with present and future V/STOL designs. The V/STOL aircraft's flexibility in the selection of flight procedures allows it to adapt well to local conditions. This is important not only militarily but also in terms of optimum economy and noise abatement. Author

N74-21651*# Scientific Translation Service, Santa Barbara, Calif.
VSTOL AIRCRAFT STABILITY AND CONTROL EXPERIENCE FROM METHODS AND RESULTS OF Do 31 FLIGHT TESTS
H. Wuennenberg Washington NASA Apr. 1974 84 p refs Transl. into ENGLISH of "Stabilitaet und Steuerbarkwit von VSTOL-Flugzuegen nach Verfahren und Ergebnissen aus der Do 31-Flugerprobung", Dornier-Werke G.m.b.H., Friedrichshafen, West Germany, BMVG-FBWT-72-25, 1972 90 p
(Contract NASw-2483)
(NASA-TT-F-15531; BMVg-FBWT-72-25) Avail: NTIS HC $7.25 CSCL 01C

Stability and control of V/STOL aircraft are discussed. Though the V/STOL handling qualities criteria in AGARD-Rep 577 and US-MIL-F-83300 correspond to a certain extent to the flight test results of the Do 31, the MIL Spec. in particular is not applicable to jet lift V/STOL aircraft with attitude stabilization systems. The principles of control and stabilization used for the Do 31 have proved its validity and have even enabled the pilots to perform simulated IFR transitions up to hovering flight. However, for an operational aircraft, improvements to simplify handling and further automation of the landing approach are essentially necessary for all-weather operations. Author

N74-21652*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPARISON OF ACOUSTIC PERFORMANCE OF FIVE MUFFLER CONFIGURATIONS ON A SMALL HELICOPTER
Robert J. Pegg and David A. Hilton Washington May 1974 37 p refs
(NASA-TN-D-7495; L-8990) Avail: NTIS HC $3.25 CSCL 01C

A field noise measurement program has been conducted on a standard Bell 47 series helicopter and on one that had been modified with specially designed, airframe-mounted mufflers to reduce the engine exhaust noise. The purpose of the study was to evaluate the acoustic performance of five experimental exhaust muffler configurations for a helicopter reciprocating engine in an operational environment. All muffler configurations produced beneficial engine exhaust noise reductions but some configurations were markedly better than others. Flyover noise results indicated that maximum overall noise reductions of approximately 8 db were obtained with the various mufflers. The rotor noise was judged to be the dominant noise component for the muffler-equipped helicopters whereas the engine noise was the dominant component for the basic configuration. Author

N74-21653*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXTRACTION FROM FLIGHT DATA OF LONGITUDINAL AERODYNAMIC COEFFICIENTS FOR F-8 AIRCRAFT WITH SUPERCRITICAL WING
James L. Williams and William T. Suit Washington May 1974 26 p refs
(NASA-TN-D-7470; L-9203) Avail: NTIS HC $3.25 CSCL 01C

The longitudinal aerodynamic derivatives of the F-8 aircraft with supercritical wing were obtained from flight data by a parameter-extraction algorithm at Mach numbers of 0.8, 0.9, and 0.98. A set of derivatives were obtained from which calculated aircraft responses were correlated almost identically with actual flight responses. In general, the trends of the extracted derivatives obtained by the algorithm agreed with those obtained by a Newton-Raphson method and with preliminary data from the Langley 8-foot transonic pressure tunnel. The wind-tunnel damping derivatives were, however, substantially higher than the converged damping derivatives possibly because of Reynolds number differences between flight and model tests. Author

N74-21654*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SENSITIVITY OF TRANSPORT AIRCRAFT PERFORMANCE AND ECONOMICS TO ADVANCED TECHNOLOGY AND CRUISE MACH NUMBER
Mark D. Ardema Feb. 1974 55 p
(NASA-TM-X-62336) Avail: NTIS HC $5.75 CSCL 01C

Sensitivity data for advanced technology transports has been systematically collected. This data has been generated in two separate studies. In the first of these, three nominal, or base point, vehicles designed to cruise at Mach numbers .85, .93, and .98, respectively, were defined. The effects on performance and economics of perturbations to basic parameters in the areas of structures, aerodynamics, and propulsion were then determined. In all cases, aircraft were sized to meet the same payload and range as the nominals. This sensitivity data may be used to assess the relative effects of technology changes. The second study was an assessment of the effect of cruise Mach number. Three families of aircraft were investigated in the Mach number range 0.70 to 0.98: straight wing aircraft from 0.70 to 0.80; sweptwing, non-area ruled aircraft from 0.80 to 0.95; and area ruled aircraft from 0.90 to 0.98. At each Mach number, the values of wing loading, aspect ratio, and bypass ratio which resulted in minimum gross takeoff weight were used. As part of the Mach number study, an assessment of the effect of increased fuel costs was made. Author

N74-21655*# Boeing Commercial Airplane Co., Seattle, Wash.
REDUNDANT ACTUATOR DEVELOPMENT STUDY Final Report
D. R. Ryder Dec. 1973 73 p refs
(Contract NAS2-7653)
(NASA-CR-114730; D6-41511) Avail: NTIS HC $6.75 CSCL 01C

Current and past supersonic transport configurations are reviewed to assess redundancy requirements for future airplane control systems. Secondary actuators used in stability augmentation systems will probably be the most critical actuator application and require the highest level of redundancy. Two methods of actuator redundancy mechanization have been recommended for further study. Math models of the recommended systems have been developed for use in future computer simulations. A long range plan has been formulated for actuator hardware development and testing in conjunction with the NASA Flight Simulator for Advanced Aircraft. Author

N74-21656*# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft.
EVALUATION OF GRAPHITE COMPOSITE MATERIALS FOR BEARINGLESS HELICOPTER ROTOR APPLICATION
M. G. Ulitchny and J. J. Lucas Jan. 1974 44 p refs
(Contract NAS1-12622)
(NASA-CR-132414) Avail: NTIS HC $5.25 CSCL 01C

Small scale combined load fatigue tests were conducted on twelve unidirectional graphite-glass scrim-epoxy composite specimens. The specimens were 1 in. (2.54 cm) wide by 0.1 in. (.25 cm) thick by 5 in. (12.70 cm) long. The fatigue data was developed for the preliminary design of the spar for a bearingless helicopter main rotor. Three loading conditions were tested. Combinations of steady axial, vibratory torsion, and vibratory bending stresses were chosen to simulate the calculated stresses which exist at the root and at the outboard end of the pitch change section of the spar. Calculated loads for 150 knots (77.1 m/sec) level flight were chosen as the baseline condition. Test stresses were varied up to 4.4 times the baseline stress levels. Damage resulted in reduced stiffness; however, in no case was complete fracture of the specimen experienced. Author

N74-21657# National Transportation Safety Board, Washington, D.C.
SPECIAL STUDY: US GENERAL AVIATION ACCIDENTS INVOLVING FUEL STARVATION, 1970 - 1972
11 Apr. 1974 29 p
(NTSB-AAS-74-1) Avail: NTIS HC $4.50

Fuel starvation accidents are analyzed involving 29 selected makes and models of fixed-wing aircraft, which occurred in all operations of U. S. General Aviation from 1970 through 1972.

Of the selected group, 12 aircraft were found to be more, or less, susceptible to fuel starvation than the others. Accidents involving these 12 aircraft were reviewed in detail to define the primary causes of fuel starvation and other associated causal factors. Chronic difficulties and influential factors, found in the accident file review and technical research were discussed with representatives of the Federal Aviation Administration and three manufacturers of general aviation aircraft. From these discussions, remedial measures to reduce the number of fuel starvation accidents were formulated. Author

N74-21658*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SIMULATION OF DECELERATING LANDING APPROACHES ON AN EXTERNALLY BLOWN FLAP STOL TRANSPORT AIRPLANE

William D. Grantham, Luat T. Nguyen, and Perry L. Deal Washington May 1974 50 p refs

(NASA-TN-D-7463; L-9242) Avail: NTIS HC $3.25 CSCL 01C

A fixed-base simulator program was conducted to define the problems and methods for solution associated with performing decelerating landing approaches on a representative STOL transport having a high wing and equipped with an external-flow jet flap in combination with four high-bypass-ratio fan-jet engines. Real-time digital simulation techniques were used. The computer was programed with equations of motion for six degrees of freedom and the aerodynamic inputs were based on measured wind-tunnel data. The pilot's task was to capture the localizer and the glide slope and to maintain them as closely as possible while decelerating from an initial airspeed of 140 knots to a final airspeed of 75 knots, while under IFR conditions. Author

N74-21659*# Developmental Sciences, Inc., City of Industry, Calif. Aerospace Technology Div.

OBLIQUE WING REMOTELY PILOTED RESEARCH AIRCRAFT. VOLUME 1: DEVELOPMENT Final Report

Apr. 1974 144 p Original Contains Color Illustrations

(Contract NAS2-7211)

(NASA-CR-114723) Avail: NTIS HC $10.25 CSCL 01C

The NASA Ames/DSI oblique wing remotely piloted research aircraft is a highly unusual, variable remotely piloted vehicle whose configuration and capabilities are the result of certain initial design guidelines that, in terms of conventional aircraft structures and configurations, would be considered to be contradictory and unachievable. Accordingly, the novel design of the yawed wing RPV is at odds in many respects with conventional aircraft practice. Novelty, then, forms the first, unwritten, design guideline. This design is intended to move away from convention in geometry, structure, and materials. The specific guidelines followed in the design of the yawed wing RPV and a short discussion of the impact of each on the configuration of the vehicle are presented. Author

N74-21660*# Battelle Columbus Labs., Ohio.

EFFECTIVENESS EVALUATION OF STOL TRANSPORT OPERATIONS (PHASE 2) Final Report

David W. Welp, Ronald A. Brown, David G. Ullman, and Mark B. Kuhner 8 Feb. 1974 204 p refs

(Contract NAS2-6889)

(NASA-CR-137481) Avail: NTIS HC $13.25 CSCL 01C

A computer simulation program which models a commercial short-haul aircraft operating in the civil air system was developed. The purpose of the program is to evaluate the effect of a given aircraft avionics capability on the ability of the aircraft to perform on-time carrier operations. The program outputs consist primarily of those quantities which can be used to determine direct operating costs. These include: (1) schedule reliability or delays, (2) repairs/replacements, (3) fuel consumption, and (4) cancellations. More comprehensive models of the terminal area environment were added and a simulation of an existing airline operation was conducted to obtain a form of model verification. The capability of the program to provide comparative results (sensitivity analysis) was then demonstrated by modifying the aircraft avionics capability for additional computer simulations. Author

N74-21661*# California Univ., Davis. Dept. of Mechanical Engineering.

STUDY OF DYNAMICS OF X-14B VTOL AIRCRAFT Final Report, Oct. 1970 - Sep. 1973

W. V. Loscutoff, J. L. Mitchiner, R. A. Roesener, and J. A. Seevers Nov. 1973 253 p refs

(Grant NGR-05-004-051)

(NASA-CR-138185) Avail: NTIS HC $15.75 CSCL 01C

Research was initiated to investigate certain facets of modern control theory and their integration with a digital computer to provide a tractable flight control system for a VTOL aircraft. Since the hover mode is the most demanding phase in the operation of a VTOL aircraft, the research efforts were concentrated in this mode of aircraft operation. Research work on three different aspects of the operation of the X-14B VTOL aircraft is discussed. A general theory for optimal, prespecified, closed-loop control is developed. The ultimate goal was optimal decoupling of the modes of the VTOL aircraft to simplify the pilot's task of handling the aircraft. Modern control theory is used to design deterministic state estimators which provide state variables not measured directly, but which are needed for state variable feedback control. The effect of atmospheric turbulence on the X-14B is investigated. A maximum magnitude gust envelope within which the aircraft could operate stably with the available control power is determined. Author

N74-21662*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FORCE MODIFICATION AND DEFLECTION LOSS COMPENSATION TO THE PILOT'S CONTROLS IN AN AIRCRAFT SIMULATOR

William B. Cleveland Washington NASA May 1974 18 p

(NASA-TM-X-3058; A-5359) Avail: NTIS HC $3.00 CSCL 01C

Control loader systems are used widely in flight simulator cockpits so that pilots may experience the correct forces while manipulating the flight controls. Two simulators at Ames Research Center the Flight Simulator for Advanced Aircraft (FSAA) and the Moving Cab Transport Simulator (MCTS) - contain control loader systems that exhibit small control deflection losses at high forces. These losses make force calibration and documentation difficult and also may cause losses in control authority of the simulated aircraft. The study of the deflection losses indicates that the major cause is a structural or mechanical distortion that is linear with applied force. Thus, the phenomena may be modeled and, subsequently, compensation for the losses may be made in the associated simulation computer. Author

N74-21663# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.

PROBLEMS OF PILOT-AUTOMATIC CONTROL INTERACTIONS IN FLIGHT CONTROL [DAS PROBLEM DES ZUSAMMENWIRKENS VON FLUGZEUGFUEHRER UND REGLER IN DER FLUGFUEHRUNG]

D. Dey and U. Kirchhoff May 1973 134 p refs In GERMAN

(ILR-4-1973) Avail: NTIS HC $9.75

The problems in pilot-controller interaction are discussed from the viewpoints of blind landing automation for CTOL aircraft and stabilization of VTOL aircraft. For the optimization of the task division between pilot and automation, the properties and capabilities of the human being were compared with those of the technical controller. Optimization criteria for the design of a flight control system are requirements of safety, performance, and economy. Based on the complementary properties of the pilot and the automatic system, a strong man-machine integration is proposed, and the model representations of a hierarchical systems structure for systematic design of flight control systems is described. The hierarchy model is applied to the guidance simulation study of a hovering VTOL aircraft. ESRO

N74-21664# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

A NUMERICAL STUDY OF THE EFFECTS OF AIRCRAFT MANOEUVERS ON THE FOCUSING OF SONIC BOOMS

Ronald O. Onyeonwu Jul. 1973 120 p refs

(Grant AF-AFOSR-1885-70; AF Proj. 9783)

(AD-775095; UTIAS-192; AFOSR-74-0181TR) Avail: NTIS CSCL 01/2

The effects of aircraft maneuvers on the focusing of sonic

booms are investigated for a model atmosphere which is piecewise linear in wind and sound speeds, and piecewise constant in wind direction. Ray-tube areas and trajectories are obtained in closed form for a real atmosphere with winds and aircraft in arbitrary maneuvers. A mathematical formalism is developed for identifying the focusing ray in general maneuvers, leading to a direct and accurate determination of the caustic surface ground intercept. The algorithms derived in the analysis complement those of Hayes to form the basis for a computer program for predicting sonic boom properties. There appears to be a ten-fold reduction in computing time as compared with the Hayes-Haefeli program. (Modified author abstract) GRA

N74-21665# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
F-14 OPTIMUM FLIGHT MODES, VOLUME 1 Final Report, 1 Jul. 1972 - 30 Sep. 1973
D. C. Sederstrom and K. L. Curtner Oct. 1973 121 p refs
(Contract N00014-72-C-0405; NR Proj. 213-098)
(AD-775246) Avail: NTIS CSCL 01/3

An F-14 optimum flight modes study is described. The overall objective of the project was to define an energy management demonstration system which could use the F-14A with its existing computer systems as a flight test vehicle. The work included development of a computer program to determine performance and generate trajectories for various energy management modes. An energy management demonstration system is presented, the computational algorithm is described, and potential performance benefits resulting from the use of an energy management system are discussed. Author (GRA)

N74-21666# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
CIRCULATION CONTROL: A BIBLIOGRAPHY OF NSRDC RESEARCH AND SELECTED OUTSIDE REFERENCES
Michael B. Stone and Robert J. Englar Jan. 1974 18 p refs
(AD-775284; NSRDC-4108; Aero-1191) Avail: NTIS CSCL 01/1

The report presents a bibliography of technical notes, formal reports, and technical papers by personnel of the Rotary Wing Division of the Aviation and Surface Effects Department, Naval Ship Research and Development Center (NSRDC) from the beginning of calendar year 1969 until the end of fiscal year 1973. The citations are arranged chronologically and represent the technology of circulation control as it has developed at NSRDC. The report also contains appendixes of selected outside references which are pertinent to circulation control. Author (GRA)

N74-21667# Borst (Henry V.) and Associates, Rosemont, Pa.
SUMMARY OF PROPELLER DESIGN PROCEDURES AND DATA. VOLUME 1: AERODYNAMIC DESIGN AND INSTALLATION
Henry V. Borst Nov. 1972 323 p refs
(Contract DAAJ02-72-C-0033; DA Proj. 1G1-62207-AA-72)
(AD-774831; USAAMRDL-TR-73-34A-Vol-1) Avail: NTIS CSCL 01/3

The technology needed for the design and installation of propellers is presented and summarized in three volumes. Volume I (Aerodynamic Design and Installation) contains the basic theory and necessary design procedures for establishing the external geometry and performance of any propeller. The procedures and data which apply for both single and dual rotation propellers are established for the entire range of flight conditions. The performance of propellers operating at off design condition, high values of shaft angle of attack and negative thrust condition is given. Author (GRA)

N74-21668# Borst (Henry V.) and Associates, Rosemont, Pa.
SUMMARY OF PROPELLER DESIGN PROCEDURES AND DATA. VOLUME 2: STRUCTURAL ANALYSIS AND BLADE DESIGN Final Technical Report
William Amatt, William E. Bates, and Henry V. Borst Nov. 1973 381 p refs
(Contract DAAJ02-72-C-0033; DA Proj. 1G1-62207-AA-72)
(AD-774836; USAAMRDL-TR-73-34B-Vol-2) Avail: NTIS CSCL 01/3

The technology needed for the design and installation of propellers is presented and summarized in three volumes. Volume 2 (Structural Analysis and Blade Design) contains the theory and data for the detailed structural and vibration analysis of propellers. Included are estimating procedures for initial design purposes; the details for designing solid, hollow, and composite blades; and manufacturing techniques used. Author (GRA)

N74-21669# Naval Coastal Systems Lab., Panama City, Fla.
HELICOPTER TOW TESTS OF THE US COAST GUARD'S AIR DELIVERY CONTAINER FOR OIL SPILL CONTAINMENT BARRIER
John R. Kennedy Dec. 1973 23 p refs
(AD-774898; NCSL-198-73) Avail: NTIS CSCL 13/2

An oil spill barrier with its air delivery packing container was successfully towed by a Navy H-53 tow-equipped helicopter. Flight tow tests were conducted to demonstrate feasibility, develop any required special equipment, and provide data for similar Coast Guard tests. Author (GRA)

N74-21670# Speas (R. Dixon) Associates, Manhasset, N.Y.
AIRLINE INDUSTRY FINANCIAL ANALYSIS WITH RESPECT TO AIRCRAFT NOISE RETROFIT PROGRAMS 1972-1978 Final Report, Aug. - Dec. 1972
Leroy Simpson, Robert C. Knowles, and Jack B. Feir Jan. 1973 69 p refs
(Contract DOT-OS-20088)
(PB-226586/6GA; POT-OST-ONA-73-1) Avail: NTIS HC $3.50 CSCL 01C

An examination was made of the factors related to the financing of capital investments that would be required by the principal U.S. airlines to purchase and to install proposed noise reducing retrofit hardware on their JT-3D and/or JT-8D engined aircraft. The study indentified the number of such turbofan aircraft expected to be retrofit, the range of capital costs for three alternative retrofit programs, the relationship of such costs to total future airline financing requirements, and the variation of retrofit cost impact among carriers in the U.S. airline industry. The cost impact of retrofit was analyzed in relation to a forecast of the principal U.S. carriers' total future financing requirements for flight and ground equipment. Total future financing requirements were analyzed in detail for four selected airlines.
Author (GRA)

N74-21671# Boeing Vertol Co., Philadelphia, Pa.
TAIL ROTOR DESIGN GUIDE Final Report, Nov. 1972 - Aug. 1973
Wayne Wiesner and Gary Kohler Jan. 1974 254 p refs
(Contract DAAJ02-73-C-0010; DA Proj. 1F1-62204-AA-43)
(AD-775391; D210-10687-1; USAAMRDL-TR-73-99) Avail: NTIS CSCL 01/3

The report presents general guidelines for the preliminary design of tail rotors for single-rotor helicopters in low-speed and hover flight. Application of these guidelines should alleviate the directional control problems of single-rotor helicopters under certain conditions of wind speed and direction, height above the ground, gross weight, and altitude. The main data base used to develop the guidelines is the results of a wind tunnel test of a tail rotor helicopter model conducted by Boeing. These tests were conducted in and out of ground effect, in various wind speeds to 35 knots, and with varying wind azimuths. (Modified author abstract) GRA

N74-21672# Army Aviation Systems Command, St. Louis, Mo.
MAJOR ITEM SPECIAL STUDY (MISS), CH-47A HYDRAULIC SERVOCYLINDER Interim Report, 1 Jan. 1964 - 1 Jul. 1973
Feb. 1974 22 p refs
(AD-775449; USAAVSCOM-TR-74-10) Avail: NTIS CSCL 01/3

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change in items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From the data, removal distributions can

be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program areas. Author (GRA)

N74-21673# McDonnell Aircraft Co., St. Louis, Mo.
AIR-TO-AIR FIRE CONTROL EXPOSITION, PHASE 3 (EXPO 3) Final Report, May 1972 - Jan. 1973
Robert L. Berg and Michael M. Sears Sep. 1973 117 p refs
(Contract F33615-72-C-2046; AF Proj. 69DF)
(AD-775360; AFAL-TR-73-287) Avail: NTIS CSCL 19/5

The Air-to-Air Fire Control Exposition (EXPO) Program, which has as its goal investigate fire control system concepts for use in advanced fighter aircraft, was continued as a Phase 3 effort. The objectives of this follow-on phase were to model and program combined fire control system approaches (which included that of an associated participant) to the air-to-air gunnery problem, model and implement degraded sensor inputs to the fire control system models, provide capability for investigation of high velocity ammunition, and to define a test plan for a flight simulator optimization and evaluation of the fire control systems in a subsequent program phase. (Modified author abstract) GRA

N74-21674# Naval Postgraduate School, Monterey, Calif.
DATA REDUCTION SYSTEM FOR THE XR-3 CAPTURED AIR BUBBLE TESTCRAFT M.S. Thesis
Peter Vincent Dabbieri, Jr. Dec. 1973 98 p refs
(AD-775016) Avail: NTIS CSCL 13/10

A fast, accurate and portable data reduction system was developed for the XR-3 captured air bubble testcraft being evaluated at the Naval Postgraduate School, Monterey, California. The system consists of four units. A magnetic tape recorder is used for data play back. A signal conditioner unit with a built-in analog-to-digital converter was developed and is used to filter, amplify, sum and further prepare the data for transmission to either a strip chart recorder or a digital X-Y plotter through a Monroe 1880 calculator. (Modified author abstract) GRA

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-21675 California Inst. of Tech., Pasadena. Environmental Quality Lab.
PROJECT SAGE PHASE 1 REPORT: SOLAR ASSISTED GAS ENERGY WATER HEATING FEASIBILITY FOR APPLICATION IN NEW APARTMENTS
Edgar S. Davis Jun. 1973 47 p refs Sponsored in part by Southern Calif. Gas Co.
(Grant NSF GI-29726)
(EQL-Memo-11) Copyright. Avail: Issuing Activity

The feasibility of developing a commercial product for solar water heating in apartment buildings in Southern California is investigated. A definition of a baseline system is given, specifying plumbing configuration, materials, components, and collector design concept. An estimation of system cost and performance is also included along with the identification of component design, enabling solar water heating to become commercially viable. Author

N74-21676# Bureau of Mines, Morgantown, W.Va.
OIL SHALE: A CLEAN ENERGY SOURCE
Sidney Katell, Reid Stone, and Paul Wellman [1974] 27 p Presented at the 18th Ann. Meeting of the Am. Assoc. of Cost Engr., Los Angeles, 30 Jun. - 3 Jul. 1974
Avail: NTIS HC $4.50

Shale oil needs to be developed to take its place among the usable reserves of energy supplies in the future. Environmental concerns are broad and encompass industrial and surrounding socio-economic area. Industrial activities and responsibilities of the potential developer are presented. Author

N74-21677*# Scientific Translation Service, Santa Barbara, Calif.
WIND POWER TURBOGENERATOR FOR HIGH ALTITUDE WIND UTILIZATION
H. Honnef Washington NASA Apr. 1974 12 p Transl. into ENGLISH from German patent no. 885284(3 Aug. 1953) 4 p
(Contract NASw-2483)
(NASA-TT-F-15455) Avail: NTIS HC $4.00 CSCL 10A

A windpowered electrical generator is reported that consists of two counter-rotating wheels, one being the armature and the other being the field. Means of compensating for varying wind speed are described. Author

N74-21678*# Kanner (Leo) Associates, Redwood City, Calif.
THE PRESENT STATE OF PLANNING AND ERECTION OF LARGE EXPERIMENTAL WIND-POWER STATIONS
V. R. Sektorov Washington NASA Apr. 1974 15 p Transl. into ENGLISH from Elektrichestvo (Moscow), no. 2, 1933 p 9-13
(Contract NASw-2481)
(NASA-TT-F-15512) Avail: NTIS HC $4.00 CSCL 10A

An investigation into the use of wind-power stations, which are planned for the second 5-Year Plan is discussed. The size of stations planned is 5000 kW, and they are to be built in areas of the country where there is a sufficient annual wind speed to justify economic use. The Balaklava experimental station was investigated and results show that it was economical, but new research must be done to improve overall performance. Author

N74-21679*# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES OF THE UTILIZATION OF WIND ENERGY: THE USE OF dc GENERATOR/MERCURY-VAPOR INVERTER SETS CONNECTED TO ac NETWORKS
Antonino Asta Washington NASA Apr. 1974 14 p refs Transl. into ENGLISH from Ric. Sci. (Rome), no. 1-2, Jan. - Feb. 1950 p 53-59
(Contract NASw-2481)
(NASA-TT-F-15514) Avail: NTIS HC $4.00 CSCL 10C

Different types of electrical generators are reviewed that can be used with wind energy. A set is described that is comprised of a generator supplied by a suitable type of excitation and a mercury-vapor inverter capable of incorporation in a three-phase network with constant voltage and frequency, provided with reservoirs, by a fixed-pitch air motor without a speed regulator. Experimental results obtained with such a set are reported. Author

N74-21680*# Kanner (Leo) Associates, Redwood City, Calif.
REPORT ON RESULTS ACHIEVED WITH SEAS EXPERIMENTAL MILL
J. Juul Washington NASA Apr. 1974 15 p Transl. into ENGLISH from Elektroteknikeren (Copenhagen) p 5-12
(Contract NASw-2481)
(NASA-TT-F-15515) Avail: NTIS HC $4.00 CSCL 10A

The SEAS experimental windmill was built in order to attempt operation of a three-phase alternating current generator with a wind turbine as drive power in conjuction with existing ac installations. Testing in natural wind was carried out on the wing shapes that have proved in windtunnel tests to be the most feasible. Investigations were made on how much power can be achieved per unit area within the periphery of the wingtips (= wingspread area). Annual production that can be achieved per unit of wingspread area was determined. The following requirements were worked out experimentally: (1) the most favorable wingtip velocity; regulation arrangement of the wing; (3) the necessary automatic apparatus. Finally, the maximum effect of the wind turbine's axle in the wind direction was measured. Author

N74-21681*# Kanner (Leo) Associates, Redwood City, Calif.
THIS IS HOW YOU CAN HEAT YOUR HOME WITH A LITTLE WINDMILL
Washington NASA Apr. 1974 13 p refs Transl. into ENGLISH from Nv Teknik (Sweden), no. 3, Jan. 1974 p 8-9

(Contract NASw-2481)
(NASA-TT-F-15518) Avail: NTIS HC $4.00 CSCL 10A

For many years, small windmills with generators and storage batteries have been available for supplying electricity to remote locations; but storage batteries are so expensive, that this type of electrical supply is normally unrealistic. A better way of utilizing wind power in a smaller installation is to let the electrical current take care of home heating via a heat accumulator, which has low maintenance cost and simple electrical equipment. One such installation is described in this article, and figures on its economic feasibility are provided. Author

N74-21682*# Kanner (Leo) Associates, Redwood City, Calif.
WIND ELECTRIC POWER STATION
Hermann Honnef Washington NASA Apr. 1974 14 p Transl. into ENGLISH from German Patent no. 871580(23 Mar. 1953)
(Contract NASw-2481)
(NASA-TT-F-15522) Avail: NTIS HC $4.00 CSCL 10A

A wind power station is described in which the structure on which the rotors are mounted may tilt as wind speed changes so that the rotors leave the vertical plane to anticipate increased wind speeds. The power station may have pulse generators located in front of the turbine rotors on extensions of the turbine shaft or on separated booms under the turbine; winches to tilt the turbine platform, normally locked by means of a brake, which is released when a predetermined wind thrust is reached; flexible tension members to transmit the thrust of the wind to the nontilting portion of the structure; provisions to change the direction of the winches as wind speed changes; an auxiliary vane to control an electrically driven propeller to rotate the power plant into the wind; and auxiliary generators to be used when wind speeds are too low for normal synchronous operation. Author

N74-21683# Committee on Science and Astronautics (U. S. House).
SOLAR HEATING AND COOLING DEMONSTRATION ACT
Washington GPO 1974 510 p refs Hearings on H.R. 10952 et al. before Comm. on Sci. and Astronaut., 93rd Congr., 1st Sess., No. 24, 13-15 Nov. 1973
(GPO-27-370) Avail: Subcomm. on Energy

The feasibility of using solar energy for the heating and cooling of buildings is discussed and the development of solar heating technology to meet performance criteria is projected. G.G.

N74-21684# Commission of the European Communities, Brussels (Belgium).
MEDIUM-TERM PROSPECTS AND GUIDELINES IN THE COMMUNITY GAS SECTOR
1972 91 p
Avail: NTIS HC $7.75

A summary of the main government measures affecting the operation of the gas industry in various European nations is presented. The gas supply, consumption, transport, distribution, and storage are discussed along with the capital investments, prices, and the structure of gas enterprises in the community. F.O.S.

N74-21685*# Heliotek, Sylmar, Calif.
STUDY TERRESTRIAL APPLICATIONS OF SOLAR CELL POWERED SYSTEMS Final Report
Jerry W. Ravin Sep. 1973 134 p
(Contract NAS3-16828)
(NASA-CR-134512) Avail: NTIS HC $9.75 CSCL 10A

Terrestrial applications of solar cells and design systems are considered for those applications that show the most promise for becoming practical and accepted by users within the next five years. The study includes the definition, categorization, evaluation and screening of the most attractive potential terrestrial applications for solar cells. Potential markets are initially grouped and categorized in a general sense and are weighted in priority by their business volume, present and future. From a categorized list including marine, transportation, security, communication, meteorological and others, 66 potential solar cell applications have been cataloged. A methodology was formulated to include the criteria for evaluation and screening. The evaluation process covers all parts and components of the complete system required for each application and gives consideration to all factors, such as engineering, economic, production, marketing and other factors that may have an influence on the acceptance of the system. Author

N74-21686# Michigan Public Service Commission.
CONSERVATION AND EFFICIENT USE OF ENERGY: A STATE REGULATOR'S VIEW
William R. Ralls 10 Jul. 1973 15 p refs
Avail: NTIS HC $4.00

Alternatives available for the conservation and efficient use of energy are discussed. Energy shortages and problems are analyzed, and the steps for alleviating the shortages are outlined. Energy policies of the Wisconsin Public Service Commission are discussed along with state and national conservation measures. It is concluded that government decision makers must recognize their responsibility to the public to go beyond the umpire role, and take strong, affirmative action to reduce energy consumption and promote efficient use. F.O.S.

N74-21687# Wisconsin Univ., Madison.
ELECTRICITY GROWTH: ECONOMIC INCENTIVES AND ENVIRONMENTAL QUALITY
Charles J. Cicchetti Jan. 1973 47 p refs
Avail: NTIS HC $5.50

The consumption of electricity continues to double in the United States at intervals equal to about 10 years. Some of the institutional reasons why these exponential rates continue are examined with special emphasis on economic incentives and the regulatory climate under which privately owned electric utilities operate. The public utility pricing question is considered from the economists' point of view. The findings of various econometric analysis of the demand for electricity are reviewed and the question of rate of return and utility growth is considered. Some environmental policy options and important new research directions are also discussed. Author

N74-21688*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRICALLY RECHARGEABLE REDOX FLOW CELLS
Lawrence H. Thaller 1974 6 p refs Proposed for presentation at 9th Intersoc. Energy Conversion Eng. Conf., San Francisco, 26-30 Aug. 1974
(NASA-TM-X-71540; E-7922) Avail: NTIS HC $4.00 CSCL 10A

Considering the topographical and sizing requirements for a typical pumped water storage installation and the immergence of energy conversion schemes that are time dependent as to their generating capability, a closer look is being given to nonpumped water storage schemes for storing electricity. An electrochemical bulk power storage concept, which was named a rechargeable redox flow cell is described. This scheme, based on pumping a redox couple through a power conversion section, appears to offer high overall efficiency, no cycle life limitations for the electrodes, and deep discharger capability. Author

N74-21689# Los Alamos Scientific Lab., N.Mex.
GEOTHERMAL ENERGY
M. C. Smith 1973 9 p
(Contract W-7405-eng-36)
(LA-UR-73-1316) Avail: NTIS HC $3.00

Dry hot rock in the earth's crust represents the largest and most broadly distributed reservoir of usable energy accessible to man. The engineering equipment and methods required to extract and use this energy appear to exist and are now being investigated actively as LASL. At least for deep systems in relatively impermeable rock, not close to active faults, the extraction of energy from dry geothermal reservoirs should involve no significant environmental hazards. The principal environmental effects of such energy systems will be those associated with the surface facilities that use the geothermal heat; these will be visual, in land use, and in the thermal-pollution potential of low-temperature power plants. The energy extraction system itself should be clean, safe, unobtrusive, and economical. Author (NSA)

N74-21690# Los Alamos Scientific Lab., N.Mex.
POTENTIAL FOR THE PRODUCTION OF POWER FROM GEOTHERMAL RESOURCES

M. C. Smith 1973 18 p
(Contract W-7405-eng-36)
(LA-UR-73-926) Avail: NTIS HC $3.00

The nature and magnitude of the hot, dry rock geothermal energy resource are such that within the next 10 to 15 years it could begin to contribute significantly to the solution of some of our nation's most urgent energy, pollution, and balance-of-payments problems. A program to investigate and develop this resource was undertaken by the Atomic Energy Commission at Los Alamos Scientific Laboratory, and initial results from that program are described. It appears that the equipment and techniques required to make this vast energy reservoir useful already exist, and that a convincing demonstration of its usefulness is possible within less than five years. Author (NSA)

N74-21691# Los Alamos Scientific Lab., N.Mex.
POTENTIAL FOR HOT-DRY-ROCK GEOTHERMAL ENERGY IN THE WESTERN UNITED STATES
D. W. Brown 25 Jul. 1973 22 p refs
(Contract W-7405-eng-36)
(LA-UR-73-1075) Avail: NTIS HC $3.25

The U.S. Geological Survey has identified 1.8 million acres (2800 square miles) of western lands as having a significant potential for geothermal development. The LASL for the past 2 years has been actively investigating the potential for and problems associated with extracting geothermal energy from the much more numerous regions of the western United States containing hot, but essentially dry, rock at moderate depths. A recent survey reveals that about 7% of the 13-state area comprising the Western Heat Flow Province--about 95,000 square miles--is underlain, at a depth of 5 km (16,400 ft), by hot rock at temperature levels above 290 C. In the Los Alamos concept, a man-made geothermal reservoir would be formed by first drilling into suitably hot rock, and then creating a very large surface area for heat transfer using conventional hydraulic fracturing techniques developed by the oil industry. Author (NSA)

N74-21692# Varta Aktiengesellschaft Forschungs- und Entwicklungszentrum, Kelkheim (West Germany).
ELECTROLYTIC CELLS WITH ORGANIC ELECTROLYTES Final Report [GALVANISCHE ZELLEN MIT ORGANISCHEN ELEKTROLYTEN ABSCHLUSSBERICHT]
Helmut Lauck Bonn Bundesmin. fuer Forsch. und Technol. Jan. 1974 22 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FBT-74-02) Avail: NTIS HC $4.25; ZLDI, Munich 4.20 DM

The results of work on high energy electrolytic cells with organic electrolytes are reported. Different solvents and electrolyte systems were studied, and their compatibility with light metal anodes investigated. Furthermore, various substances were tested as possible cathode materials. Best results were obtained with elemental sulfur, with respect to discharge voltage and current yields. It is therefore proposed to use sulfur as cathode materials for high energy cells. ESRO

N74-21693# Army Electronics Command, Fort Monmouth, N.J.
PERFORMANCE OF BATTERY BB-641/A IN OH-6A HELICOPTER Research and Development Technical Report
Sylvia Duze Feb. 1974 19 p refs
(DA Proj. 1S7-62705-AG-94)
(AD-774797; ECOM-4190) Avail: NTIS CSCL 10/3

Instrumentation was devised at ECOM to simultaneously monitor the voltage, current, and temperature of a battery during start and flight of an aircraft. Data were collected continuously on a tape recorder so that any portion of the flight could be replayed in the laboratory. A portable oscilloscope was connected to the output terminals of the tape recorder to check its operation during flight of the aircraft. Battery BB-641/A, a 24 V, 13 Ah nickel-cadmium battery used in the OH-6A Helicopter, was selected for this investigation. After flight information was collected on the tape recorder, it was played back into a memory oscilloscope in the Laboratory and significant portions of the information were photographed. In addition, continuous written record of the data was obtained by replaying the tapes back on a recording voltmeter. This information can be used to determine the adequacy of the battery under its assigned conditions of location and performance in the aircraft, and various battery designs in the aircraft can be more positively evaluated. (Modified author abstract) GRA

N74-21694# Eagle-Picher Industries, Inc., Colorado Springs, Colo. Precision Products Dept.
NICKEL-CADMIUM MONOBLOCK BATTERY BB-433(X-1)/A Final Report, Apr. 1971 - Feb. 1974
James M. Hill and Walter K. McCarter Feb. 1974 36 p
(Contract DAAB07-71-C-0269)
(AD-774811; ECOM-0269-F) Avail: NTIS CSCL 10/3

Strong, high-temperature ceramics are defined as those materials that can withstand thermal cycling without failure which is necessary for their use in high temperature structural applications. For this reason, hot-pressed Si3 N4 and SiC are emphasized. The relations between fabrication parameters, microstructure and strength are presented for both materials. Other structural considerations, viz., resistance to thermal shock and oxidation are reviewed. Finally, current directions for obtaining improved and new materials are discussed. Author (GRA)

N74-21695# Lockheed Missiles and Space Co., Sunnyvale, Calif.
CHILLED INVERTER MOTOR SYSTEM TEST Final Report
Lincoln B. Das, Richard R. Gilbert, and Louis J. Lawson Oct. 1973 60 p
(Contract DAAK02-72-C-0594; DA Proj. 1T1-62119-A-012)
(AD-775443; LMSC-D356644) Avail: NTIS CSCL 10/2

The investigations described were concerned with the elevation of the CHILL SYSTEM (a refrigerated liquid-cooling system for electric motors and solid-state power electronics). The test arrangement and results obtained indicate that further study is desirable in order to fully evaluate the performance of such a Chilled Inverter Motor System. Author (GRA)

N74-21696# Energy Research Corp., Bethel, Conn.
HIGH VOLTAGE FUEL CELL ASSEMBLY Final Report, May 1972 - Jun. 1973
Ralph N. Camp and Bernard S. Baker Jan. 1974 44 p
(Contract DAAK02-72-C-0458; DA Proj. 1T6-62705-A-012)
(AD-774820; ERC-1455F) Avail: NTIS CSCL 10/2

The concept of a high voltage, planar fuel cell element was investigated. Experimental units composed of 2, 4 and 20 single, series connected cells were built and tested for periods of greater than 100 hrs. at temperatures of 130C. Phosphoric acid contained in organic fibre matrices was the electrolyte. A design based on the performance of these units is contained in the report. Twenty-cell units were able to produce 70mA/sq cm at 12 volts. Author (GRA)

N74-21697# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
IMPACTS OF NEW ENERGY TECHNOLOGY, USING GENERALIZED INPUT-OUTPUT ANALYSIS Final Report
James E. Just Feb. 1973 302 p refs
(Grant NSF GI-32874)
(PB-226139/4GA; MIT-EL-73-1) Avail: NTIS HC $7.00 CSCL 21D

Comparative economic and environmental impacts of high and low BTU coal gasification and the gas turbine topping cycle during the 1980-85 time period were forecast. The forecast used a projected 1980 input-output table that was augmented by detailed air pollution coefficients and water, steel, and energy usage coefficients. Direct and indirect impacts of both investment in and operation of the new technologies were examined. Data was obtained from basic engineering studies of these processes and converted to input-output technical and capital coefficients. Alternative high, medium, and low energy growth futures for 1985 were projected both with and without the new technologies. Results indicate the high sensitivity of total capital investment and certain capital goods industries to the rate of energy use growth. Aggravation of the situation may result from the introduction of high BTU coal gasification. Several economic mechanisms that will help to hold total capital investment within its historical boundaries as a percentage of GNP are also examined. Possible applications, refinements, and extensions are included. GRA

N74-21698# Energy Research Corp., Bethel, Conn.
ELECTROLYTE FOR HYDROCARBON AIR FUEL CELLS Interim Technical Report, May - Nov. 1973
Ralph N. Camp and Bernard S. Baker Feb. 1974 29 p refs (Contract DAAK02-73-C-0084; DA Proj. 1T0-61102-A-34A) (AD-774832; ERC-2597S; ITR-2) Avail: NTIS CSCL 10/2

The electrochemical properties tetrafluoroethanedisulfonic acid which had been shown to be superior to phosphoric acid as an electrolyte for direct propane oxidizing fuel cells were explored further. Platinum electrodes immersed in both tetrafluoroethane-disulfonic acid and phosphoric acid saturated with propane were subjected to linear cyclic voltage sweeps and the resultant currents plotted as a function of potential. Peaks corresponding to the absorbtion and oxidation of propane were found to lie at more reversible potentials in tetrafluoroethanedisulfonic acid.
Author (GRA)

N74-21699# EIC, Inc., Newton, Mass.
LITHIUM: INORGANIC ELECTROLYTE BATTERIES Quarterly Progress Report, 17 Sep. - 15 Dec. 1973
David R. Cogley and Michael. J. Turchan Feb. 1974 42 p refs
(Contract DAAB07-74-C-0030)
(AD-775420; C-401; ECOM-0030-1; QPR-1) Avail: NTIS CSCL 10/3

The purpose of the present program is to study the feasibility of an all-inorganic electrolyte lithium primary battery operable and storable over the temperature range of -40F to +160F. The desired energy density is 150 watt-hours per pound of total battery weight and the desired power density is 50 watts per pound.
GRA

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-21700*# Techtran Corp., Glen Burnie, Md.
THE FUNCTION OF THERMOREGULATION IN PROTRACTED LIMITATION OF MOTOR ACTIVITY (HYPOKINESIA)
A. Ya. Tizul Washington NASA May 1974 9 p refs Transl. into ENGLISH from Zh. Nevropatol. Psikhiatr. (Moscow), v. 73, no. 12, 1973 p 1791-1794
(Contract NASw-2485)
(NASA-TT-F-15566) Avail: NTIS HC $4.00 CSCL 06P

Thermotopography at 10 symmetrical points and the Shcherbak thermoregulation reflex in 10 normal individuals subjected to prolonged (120-day) clinostatic hypokinesia are used to demonstrate that thermoregulation function disturbances develop along with other hypokinetic disorders so early as the beginning of the 2nd month. Subjective temperature discomfort is accompanied by changes in the zonal interrelation of skin thermotopography, torpidity or reversal of thermoregulation mechanisms in response to application of local thermal loads. Thermoregulation function disturbances increase with advancing hypokinesia. Thermoregulation is restored about a month after transfer of the subject to a normal motor regime.
Author

N74-21701*# Techtran Corp., Glen Burnie, Md.
METHOD FOR RAPID DETERMINATION OF TRANSPORT PARAMETERS OF CO2 IN MAN USING THE CAPNOGRAPH AND MULTICHANNEL RESPIRATORY MASK
A. M. Shmeleva, I. S. Breslav, and B. N. Volkov Washington May 1974 10 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 59, no. 7, Jul. 1973 p 1139-1143
(Contract NASw-2485)
(NASA-TT-F-15443) Avail: NTIS HC $4.00 CSCL 06P

Use of the capnograph and a special breathing mask is described in conjunction with the determination of the CO2 transport parameters in human subjects. This method is preferable to those previously employed inasmuch as it requires no puncture of the subject's circulatory system.
Author

N74-21702*# Techtran Corp., Glen Burnie, Md.
THE MINUTE VOLUME OF THE HEART IN VARIOUS TYPES OF BATH
Chr. Kroetz and R. Wachter Washington NASA Apr. 1974 11 p refs Transl. into ENGLISH from Klin. Wochschr. (Berlin), v. 12, 1933 p 1517-1520
(Contract NASw-2485)
(NASA-TT-F-15438) Avail: NTIS HC $4.00 CSCL 06P

Human heart minute volumes were determined under the following balneological conditions: neutral lukewarm water, oxygen, carbon dioxide brine, carbon dioxide gas, and air baths. Results show that the CO2 brine bath produced a maximum respiratory quotient and the strongest skin reactions. The minute volume increased also distinctly in the fresh water bath but not by any great amount.
G.G.

N74-21703*# Techtran Corp., Glen Burnie, Md.
MORPHOLOGICAL AND BIOCHEMICAL CHANGES IN RABBITS SUBJECTED TO CONSIDERABLE LIMITATION OF MOBILITY
A. M. Vikhert, V. I. Metelitsa, V. D. Baranova, and I. Ye. Galakhou Washington NASA May 1974 9 p refs Transl. into ENGLISH from Kardiologiya (Moscow), v. 12, Sep. 1972 p 143-146
(Contract NASw-2485)
(NASA-TT-F-15427) Avail: NTIS HC $4.00 CSCL 06C

Prolonged inhibition of mobility in rabbits has been found to result in focal medionecrosis with subsequent mediocalcinosis.
Author

N74-21704*# Kanner (Leo) Associates, Redwood City, Calif.
CARDIAC DECONDITIONING DURING PROLONGED HYPODYNAMIA
I. G. Krasnykh Washington NASA Apr. 1974 6 p Transl. into ENGLISH from Voenno-Med. Zh. (Moscow), no. 2, Dec. 1973 p 54-56
(Contract NASw-2481)
(NASA-TT-F-15528) Avail: NTIS HC $4.00 CSCL 06S

The influence of 30-day hypodynamia on heart size, stroke volume and myocardial contractility was studied on 20 male volunteers divided into 3 groups. Members of the first group stayed in bed during the whole experiment, the men of the second group were free to move in a small chamber, and members of the third group stayed in bed and performed daily intensified physical exercises. Teleroentgenokymograms were used to determine heart size (systolic and diastolic) and stroke volume. By the end of the experiment, the heart size of the men in the first group was reduced by about 20% and stayed at this level during the next month; the men also complained of dyspnea and tachycardia during physical loading. A similar reduction (about 10%) was experience by the test subjects of the second group, while in the third group these changes were insignificant. Complete restoration of heart size and stroke volume required 60 days. Daily exercises (the third group) almost fully prevented the development of cardiac deconditioning.
Author

N74-21705*# Kanner (Leo) Associates, Redwood City, Calif.
THE DANGERS OF STAYING IN BED (THE DELETERIOUS EFFECTS OF BED REST)
L. E. Boettriger Washington NASA Apr. 1974 6 p Transl. into ENGLISH from Nord. Med. (Stockholm), v. 75, no. 7, 1966 p 188-189
(Contract NASw-2481)
(NASA-TT-F-15561) Avail: NTIS HC $4.00 CSCL 06S

The literature on the deleterious effects of bed rest is reviewed. Strict bed rest produced in humans marked orthostatic hypertension, a reduced capacity on the stationary bicycle ergometer, and an increased calcium secretion. The first two changes were improved or reduced by allowing the patients to exercise or to sit up; the third, only by having them maintain an upright position for at least 3 hours per day.
Author

N74-21706*# Techtran Corp., Glen Burnie, Md.
A NEW METHOD OF EVALUATING RHEOENCEPHALOGRAMS AND ITS APPLICATION IN THE STUDY OF VERTIGO
A. Ye. Kurashvili and O. Ya. Plepis Washington NASA Apr. 1974 10 p refs Transl. into ENGLISH from Ushnykh Nosovykh Gorlovykh Bolez (Ukrainian SSR), v. 32, Sep. - Oct. 1972

p 49-52
(Contract NASw-2485)
(NASA-TT-F-15458) Avail: NTIS HC $4.00 CSCL 06E

Eighty-seven healthy individuals were examined to determine their tolerance of cumulative coriolis acceleration. Forty-eight persons tolerated it well; the other 39 showed symptoms of vertigo at different times after commencement of stimulation. The rheoencephalograms obtained in the study were processed mathematically. Analysis of the most informative parameters of the 11 coefficients of expansion of the REG curves in the Fourier series by the computer yielded the integral parameter of vestibular apparatus stability. Considerable difference was noted in cerebral blood circulation between those subject to vertigo and those who are not, this difference appearing at the very outset of coriolis acceleration application, i.e., even before vertigo symptoms were exhibited. Author

N74-21707*# Kanner (Leo) Associates, Redwood City, Calif.
CHANGES IN CEREBRAL CIRCULATION INDUCED BY HYPNOTIZATION OF THE RABBIT BY THE IMMOBILIZATION METHOD
I. T. Demchenko and P. I. Paykin. Washington NASA Apr. 1974 14 p refs Transl. into ENGLISH from Zh. Vysshei Nervnoi Deyatel'nosti (Moscow), v. 21, no. 5, Sep. 1971 p 1006-1011
(Contract NASw-2481)
(NASA-TT-F-15520) Avail: NTIS HC $4.00 CSCL 06C

Fifteen rabbits were hypnotized by fixing them in position on the stomach for 1 min. Electrodes for recording electroplethysmograms and EEG and for polarographic determination of oxygen pressure, and MT-54 thermistors were inserted stereotaxically into the sensorimotor cerebral cortex, the dorsal hippocampus, and the reticular formations of the tectum and pons. Arterial pressure was recorded through a catheter inserted into the femoral artery. It was demonstrated that the state of catalepsy in rabbits is accompanied by a sharp enhancement in brain vessel tonus and a decrease in blood flow to all structures investigated. Decrease in brain vessel tone during hypnosis induces the animal to wake up, while an enhanced tone leads to prolongation of hypnosis. Author

N74-21708*# Techtran Corp., Glen Burnie, Md.
BIONICS: THEORETICAL AND PRACTICAL PROBLEMS
U. Sh. Akhmerov. Washington NASA May 1974 11 p Transl. into ENGLISH from Vestn. Vysshey Shkoly (USSR), no. 10, Oct. 1973 p 41-45
(Contract NASw-2485)
(NASA-TT-F-15508) Avail: NTIS HC $4.00 CSCL 06D

The history of the Bionics Laboratory of Kazan' University Physics Faculty is briefly outlined. An account is given of the organization of the Laboratory, past accomplishments of the Laboratory are reviewed, and current and future problems of its activity are considered. Author

N74-21709*# Techtran Corp., Glen Burnie, Md.
PARTICIPATION OF THYROID GLAND HORMONES IN THE MECHANISM OF DEVELOPMENT OF TROPHIC DISTURBANCES OF THE GASTRIC MUCOSA IN RATS RESULTING FROM THEIR PROLONGED IMMOBILIZATION
P. P. Denisenko and A. N. Poskalenko. Washington NASA May 1974 8 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), v. 11, Jun. - Aug. 1967 p 30-32
(Contract NASw-2485)
(NASA-TT-F-15510) Avail: NTIS HC $4.00 CSCL 06P

Oral administration of thyroidin doubled the number and severity of dystrophic disturbances in the gastric wall occurring on prolonged immobilization of rats. Disturbances of the trophic system of the gastric mucosa due to immobilization were much less pronounced in thyroidectomized animals than in control rats, and one-fifth as marked as in animals treated with thyroidin. Hexonium and metamycil, a central cholinolytic, also reduced the intensity of dystrophic disturbances by one-half or even more. Author

N74-21710*# California Inst. of Tech., Pasadena. Div. of Biology.
[PHYSIOLOGY OF APLYSIA CALIFORNICA] Final Technical Report, Jul. 1969 - Jun. 1973
Felix Strumwasser. 2 Nov. 1973 11 p refs
(Grant NGR-05-002-031)
(NASA-CR-138149) Avail: NTIS HC $4.00 CSCL 06C

Summaries of research papers on the Aplysia Californica are presented. Thirty three works are cited. Emphasis is on the nervous system organization of this animal. S.K.W.

N74-21711*# Kanner (Leo) Associates, Redwood City, Calif.
COMPUTER DIAGNOSIS
L. Kruglov. Washington NASA Apr. 1974 8 p Transl. into ENGLISH from Selskaya Zhizn Newspaper (USSR), 3 Nov. 1973 4 p
(Contract NASw-2481)
(NASA-TT-F-15529) Avail: NTIS HC $4.00 CSCL 06E

An E-220 computer capable of 30 thousand operations per second was used to diagnose various diseases and defects. Specifically, the computer is programmed to diagnose 66 kinds of heart defects, various internal diseases, jaundice, rheumatism, acute peritonitis, and many other ailments. Doctors, clinics, and hospitals outside the immediate area may use the system through a teletype network. Author

N74-21712*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CIRCADIAN, ENDOCRINE, AND METABOLIC EFFECTS OF PROLONGED BEDREST: TWO 56-DAY BEDREST STUDIES
Joan Vernikos-Danellis, Charles M. Winget, Carolyn S. Leach, and Paul C. Rambaut. Washington Apr. 1974 47 p refs
(NASA-TM-X-3051; A-5339) Avail: NTIS HC $3.25 CSCL 06P

Two bedrest studies of 56 days each have been conducted to evaluate the effects of prolonged bedrest on circadian synchrony and endocrine and metabolic function. Measurements included the pituitary-adrenal, thyroid, parathyroid, insulin-glucose-growth hormones, catecholamine excretion, body temperature, and heart rate. The results indicated that a rigorous regimen of exercise did not prevent the endocrine and metabolic effects of prolonged bedrest. Changes in circadian, endocrine, and metabolic functions in bedrest appear to be due to changes in hydrostatic pressure and lack of postural cues rather than to inactivity, confinement, or the bleeding schedule. Prolonged bedrest, particularly beyond 24 days, resulted in rhythm desynchronization in spite of well regulated light/dark cycles, temperature, humidity, activity, and meal times and meal composition and in increased lability of all endocrine parameter measured. It also resulted in an apparent insensitivity of the glucose response to insulin, of cortisol secretion to ACTH, and of growth hormone secretion to hypoglycemia. Author

N74-21713*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
QUANTITATIVE VALUES OF BLOOD FLOW THROUGH THE HUMAN FOREARM, HAND, AND FINGER AS FUNCTIONS OF TEMPERATURE
Leslie D. Montgomery. Mar. 1974 88 p refs
(NASA-TM-X-62342) Avail: NTIS HC $7.50 CSCL 06P

A literature search was made to obtain values of human forearm, hand and finger blood flow as functions of environmental temperature. The sources used include both government and laboratory reports and the research presented in the open literature. An attempt was made to review many of the more quantitative noninvasive determinations and to collate the results in such a way as to yield blood flow values for each body segment as continuous functions of temperature. A brief review of the various ways used to measure blood flow is included along with an abstract of each work from which data was taken. Author

N74-21714# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
ENERGETIC ADVANTAGES OF BURST SWIMMING OF FISH
D. Weihs. Dec. 1973 28 p refs
(TAE-189) Avail: NTIS HC $4.50

It is shown theoretically that fish can swim more efficiently by alternating periods of accelerated motion and powerless gliding. Analysis of the mechanics of swimming shows that large savings of over 50% in the energy required to traverse a given distance

can be obtained by such means. In calculations based upon measured data for Salmon and Haddock, the possibility of range increases of up to 3 times the range at constant speed are demonstrated. Author

N74-21715*# Kanner (Leo) Associates, Redwood City, Calif.
COMPARATIVE STUDY OF THE EFFECTS OF SALTS ON FOUR ENZYMES FROM THE EXTREME HALOPHILE BACTERIA OF HALOBACTERIUM CUTIRUBRUM
A. I. Higa, M. C. Vidal, and J. J. Cazzulo Washington NASA May 1974 16 p refs Transl. into ENGLISH from Anales Asoc. Quim. (Argentina), v. 61, 1973 p 291-300
(Contract NASw-2481)
(NASA-TT-F-15560) Avail: NTIS HC $4.00 CSCL 06M

The effects of monovalent and bivalent cations, as chlorides, on three dehydrogenases and one synthetase partially purified from H. cutirubrum were studied. All monovalent cations tested were effective, with the exception of TRIS for glycerol dehydrogenase. The effectiveness of the same cations differed for the different enzymes. All enzymes were activated by low concentrations of Ca(++) or Mg(++). The enzymes were rapidly inactivated when incubated at 30 deg with low salt concentration; they were protected with varying effectiveness by the same salts tested as activators. The order of effectiveness of the anions Cl(-), Br(-), NO3 and SCN(-), as K(+) salts, as activators of the enzymes studied followed their effectiveness in salting out. Author

N74-21716*# Techtran Corp., Glen Burnie, Md.
POSITIVE HABITUATION AND VESTIBULAR RECRUITMENT
M. Emami-Nouri Washington NASA May 1974 12 p refs Transl. into ENGLISH from Acta Oto-Laryngol. (West Ger.), v. 76, 1973 p 183-189
(Contract NASw-2485)
(NASA-TT-F-15509) Avail: NTIS HC $4.00 CSCL 06P

Adaptation and sensory stimulation as it applied to the vestibular apparatus are discussed. Multiple rotatory, thermal, galvanic and pendular stimuli do not result in habituation. The peripheral vestibular receptor always reacts in the same manner following repeated stimuli. Adaptation is a central process, which occurs in nervous and central lesions. Author

N74-21717*# Scripta Technica, Inc., Washington, D.C.
STUDIES IN GEOMAGNETISM, AERONOMY AND SOLAR PHYSICS (PROBLEMS OF HELIOBIOLOGY AND THE BIOLOGICAL EFFECT OF MAGNETIC FIELDS) NO. 17
A. T. Platonova, ed. Washington NASA Jan. 1974 198 p refs Transl. into ENGLISH of the book "Issledovaniya po Geomagnetizmu, Aeronomii i Fizike Solntsa (Voprosy Geliobiologii i Biologicheskogo Deystviya Magnitnykh Poley), Vypusk 17" Moscow, Nauka Press, 1971 p 1-174
(Contract NASw-2484)
(NASA-TT-F-815) Avail: NTIS HC $5.50 CSCL 06C

Statistical analysis reveals correlations between changes in solar activity and the intensity of various biological processes. The biological activity of magnetic fields is proved, and research approaches to these problems are outlined. Author

N74-21718# Advisory Group for Aerospace Research and Development, Paris (France).
MAN AT HIGH SUSTAINED +Gz ACCELERATION
R. R. Burton (School of Aerospace Med.), S. D. Leverett, Jr. (School of Aerospace Med.), and E. D. Michaelson (Mt. Sinai Hosp.) Mar. 1974 31 p refs
(AGARD-AG-190; AGARDograph-190) Avail: NTIS HC $4.75 CSCL 06P

Man has tolerated +9Gz for 45 sec and +8Gz for 60 seconds. Physiological changes and tolerance limits in a sustained high acceleration environment are expressed by: (1) high heart rate; (2) reduction in Sa02; (3) cardiac arrhythmia; and (4) subject fatigue. The effects of HSG are marked in terms of gas exchange and arterial hypoxia. Fatigue appears to be the critical factor regarding human limitations to HSG, and arterial desaturation appears to be the limiting factor in subjects using a reclining seat to prevent fatigue. Author

N74-21719*# Naval Biomedical Research Lab., Oakland, Calif.
EVIDENCE FOR METABOLIC ACTIVITY OF AIRBORNE BACTERIA Quarterly Status Report
M. A. Chatigny and H. Wolochow 1 Feb. 1974 16 p refs (NASA Order W-13450)
(NASA-CR-138187; QSR-4) Avail: NTIS HC $4.00 CSCL 06M

Aerosols of the bacterium Serratia marcescens, and of uniformly labeled C-14 glucose were produced simultaneously and mixed in tubing leading to an aerosol chamber. During a subsequent period of about 5 hrs, carbon dioxide was produced metabolically within the chamber, and labeled material incorporated within the suspended particles first increased then decreased. This constitutes the first direct evidence of microbial metabolism of bacteria suspended in the air. Author

N74-21720# Atomic Energy of Canada Ltd., Chalk River (Ontario).
BIOLOGY AND HEALTH PHYSICS DIVISION Progress Report, 1 Apr. - 30 Jun. 1973
Aug. 1973 71 p refs
(AECL-4610) Avail: NTIS Avail: AEC Depository Libraries HC $5.75; Atomic Energy of Can. Ltd., Chalk River $1.50

Research progress is reported for the Biology and Health Physics Division of the Chalk River Nuclear Laboratories. Activities in the biology, population research, environmental research, and health physics branches are summarized. NSA

N74-21721# European Space Research Organization, Paris (France).
EFFECTS OF TIME SHIFT ON THE DIURNAL EXCRETION PATTERN OF 17-HYDROXYCORTICOSTEROIDS
U. Dierlich (DFVLR, Bonn) Mar. 1974 65 p refs Transl. into ENGLISH of Auswirkungen der Zeitverschiebung auf die Tagesrhythmik der 17-Hydroxycorticosteroide, DLR-FB-73-58, DFVLR, 20 Mar. 1973
(ESRO-TT-34; DLR-FB-73-58) Avail: NTIS HC $6.25; Original report in GERMAN: DFVLR, Porz, West Ger. 20,60 DM

The urinary excretion of conjugated and unconjugated 17-Hydroxycorticosteroids (17-OHCS) was studied in 8 male students in 3-hour intervals during periods of 24 hours. Two 24-hour pre-flight periods revealed the basic normal daily periodicity of 17-OHCS excretion. Effects of a 6-hour time shift were evaluated by determining the excretion rates after flights from Germany to the U.S.A. and vice versa on day 1, 3, 5 and 8 after arrival. A desynchronization with the new local time was observed after flights in both directions, the diurnal 17-OHCS excretion patterns being more disturbed, however, after the West-East flight. The resynchronization time of maximum and minimum excretion was 3-5 days after the westward travel and 5-8 or more after travelling in the opposite direction. It is suggested that the unfavorable flight conditions of the West-East flight (night flight) mainly account for the more marked time shift effects observed after the eastward flight. Author (ESRO)

N74-21722# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POSSIBLE WAYS OF ESTABLISHING PERMISSIBLE RADIATION DOSES DURING PROLONGED SPACE FLIGHTS
Yu. G. Grigorev 17 Dec. 1973 11 p Transl. into ENGLISH from the book "Somaticheskie Effekty Khronicheskogo Oblucheniya, Tezisy Dokl. na Vsesoyuznom Simpoziume: Khronicheskoe Deistvie Vneshnego Gamma-Oblucheniya na Organizm Sobak" Moscow, 16-20 Oct. 1972 p 3-6 and 9-10
(AD-773288; FTD-HT-23-648-74) Avail: NTIS CSCL 06/18

When establishing the permissible levels of radiation during prolonged space flights one should consider not only the absolute risk attributed to radiation, but also the relative risk. The latter is determined by the ratio of frequencies of the consequences due to radiation to the analogous consequences due to other factors of the external medium. The solution of the problem of risk when estimating the danger of possible radiation effects under the conditions of a prolonged flight consists of finding an optimum relationship between the known radiation danger and the advantages of the mastery of space for man. GRA

N74-21723# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
IN THE ARMCHAIR OF THE TESTER

M. Kashevnik and O. Losoto 17 Dec. 1973 10 p Transl. into ENGLISH from Leninskoe Znamya (USSR), no. 179, 2 Aug. 1973 p 2
(AD-773289; FTD-HT-23-734-74) Avail: NTIS CSCL 06/5
Training programs for cosmonauts in the U.S.S.R. are described. GRA

N74-21724# School of Aerospace Medicine, Brooks AFB, Tex.
THE INFLUENCE OF 3,5-DIETHYLHYDANTOIN UPON SURVIVAL DURING ACUTE AND CHRONIC HYPOXIA Final Report, Aug. - Nov. 1972
William E. Pepelko, Robert G. Streeter, John M. Swann, and Gene A. Dixon Dec. 1973 13 p refs
(AF Proj. 7164)
(AD-772695; SAM-TR-73-38) Avail: NTIS CSCL 06/15
The median survival times of rats decompressed within five minutes to a barometric pressure of 160 mm Hg (33.5 mm Hg PO2) were significantly increased (P less than .05 and P less than .02) in two groups of 15 rats each pretreated with 150 mg/kg body wt 3,5-diethylhydantoin (DH); rats pretreated with 50 mg/kg of the drug did not differ from controls. Maximum swimming times of 15 rats exposed to a PO2 of 77 mm Hg and a water temperature of 35C tended to be longer following pretreatment with 50 mg/kg DH (P less than .10). Sixteen of 20 saline-injected controls survived 11 days of continuous exposure to a PO2 ranging from 37 to 49 mm Hg, compared with 10 of 20 animals treated daily with 50 mg/kg and 7 of 20 treated with 150 mg/kg DH. The drug-treated animals showed more abnormal pathology than controls. It was concluded that although DH treatment may result in an increase in survival time during acute hypoxia, its apparent toxicity with repeated use in a hypoxic environment precludes its consideration in U.S. Air Force operations. (Modified author abstract) GRA

N74-21725# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
AN INVESTIGATION OF BONDING MECHANISMS AT THE INTERFACE OF A PROSTHETIC MATERIAL Annual Report, 1 Sep. 1972 - 31 Aug. 1973
Larry L. Hench, William C. Allen, Homer A. Paschall, and George Piotrowski Sep. 1973 129 p refs
(Contract DADA17-70-C-0001)
(AD-772668; Rept-4; AR-4) Avail: NTIS CSCL 06/12
Specially designed glasses and glass-ceramic implants containing Na, Ca, P, and Si ions develop a bond between the material and living bone. The formation of the interfacial bond involves the development of a SiO2 gel by loss of Na(+) ions from the surface into the extracellular fluids. Bone growing cells create collagen fibers which become entrapped in the SiO2-rich gel in 3-4 weeks. In 4-6 weeks Ca, P migration through the surface gel produces large hydroxyapatite-like crystals which interlock with naturally mineralizing bone forming a stable bond. This interfacial bonding mechanism is established using: transmission electron microscopy, ion-milling Auger spectroscopy, SEM with X-ray analysis, ion solution analysis, and various polypeptide adsorbtion studies. Techniques and computer programs for the calculation of stress in arbitrary multiply-connected cross sections have been developed and are being applied to the mechanical data obtained from the monkey experiments. Preliminary data on the variability of paired bones for biomechanical studies have been statistically evaluated and presented. (Modified author abstract) GRA

N74-21726# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A COMPARISON OF JUDGEMENTS OF VIBRATION INTENSITY FOR CHEST-TO-BACK (X AXIS) AND SIDE-TO-SIDE (Y AXIS) EXPOSURES Final Report
Richard W. Shoenberger Nov. 1973 12 p refs
(AF Proj. 7231)
(AD-773818; AMRL-TR-73-32) Avail: NTIS CSCL 06/1
The subjective intensity of vibration in the two primary horizontal axes (X axis, chest-to-back; and Y axis, side-to-side) was compared through an intensity matching procedure. Unrestrained seated subjects matched their judgements of vibration intensity in one axis (X or Y) by adjusting the intensity of vibration in the other axis until it was subjectively equal to the first. Each of eight subjects made a series of intensity judgments which were counterbalanced so that half of the matches were with an X-axis stimulus and a Y-axis response, and the other half were with a Y-axis stimulus and an X-axis response. Vibration was sinusoidal at 5, 7, 10, 15, 20, and 30 Hz. Peak accelerations at each frequency ranged from a lower limit of 0.1g to upper limits of 0.5 to 1.3g (depending on frequency). Each vibration stimulus had a duration of 20 seconds. Results showed that, within the limits of the vibration parameters sampled, X-axis vibration was judged to be slightly but consistently more intense than Y-axis vibration. (Modified author abstract) GRA

N74-21727# Tulane Univ., New Orleans, La. Biomechanics Lab.
A DISTRIBUTED PARAMETER MODEL OF THE INERTIALLY LOADED HUMAN SPINE: A FINITE DIFFERENCE SOLUTION Final Report, 1 Dec. 1971 - 1 Apr. 1973
Y. King Liu, Harold J. Cramer, and Dale U. VonRosenberg Nov. 1973 147 p refs
(Contract F33615-72-C-1212; AF Proj. 7231)
(AD-773859; AMRL-TR-73-65) Avail: NTIS CSCL 06/19
The purpose of this research was the development and solutions of nonlinear continuum models of the human spinal response to impact, with emphasis on the vertical impact-pilot ejection problem. A derivation is given for a general one-dimensional continuum model of the spine considered as a curved homogenous beam and subject to the eccentric inertial loading of the human torso. A reduction to a small strain, large deflection model is made by introducing the assumptions of linear elasticity. A further reduction to a small strain, small deflection model is made by assuming small curvatures. A three parameter viscoelastic model is also treated. Methods of solution for these nonlinear dynamic models are formulated using the finite difference calculus. (Modified author abstract) GRA

N74-21728# Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
EFFECTS OF SILVER FROM CLOUD SEEDING ON MICROFLORA OF ANIMAL DIGESTIVE SYSTEMS Final Report
James A. Bailey, Allen M. Jones, and Donald R. Roy Sep. 1973 39 p refs
(Contract DI-14-06-D-7208)
(PB-226062/8GA) Avail: NTIS HC $4.00 CSCL 06F
Hazards of silver from weather modification to microorganisms of the rabbit cecum and goat rumen were evaluated. Rabbits eliminated 99 percent of an oral dose of silver iodide within three days and essentially all of the dose in an average of 6.3 days. Only 8-26 percent of the silver entered the cecum. Digestion of a ration containing 4.2 ppm silver as silver iodide and of a ration containing 10 ppm silver as silver nitrate was not affected by the metal. Results demonstrate that silver compounds in areas of weather modification are very unlikely to inhibit microorganisms of the digestive tracts of livestock or wildlife. GRA

N74-21729# Tulane Univ., New Orleans, La. Biomechanics Lab.
A FINITE ELEMENT ANALYSIS OF WAVE PROPAGATION IN HUMAN SPINE Final Report, 1 Dec. 1971 - 30 Apr. 1973
Y. King Liu and Gautam Ray Nov. 1973 89 p refs
(Contract F33615-72-C-1212; AF Proj. 7231)
(AD-773858; AMRL-TR-73-40) Avail: NTIS CSCL 06/19
A finite element model for the dynamic configuration and force responses of the initially curved human spine has been developed in the first part of this report. The layered media column with alternate discs and vertebrae, variable lengths and cross-sectional areas along the spine has been accounted for. Application of a +Gz impulsive loading results in the simultaneous propagation of the axial, bending and shear deformations in this initially curved, inhomogeneous beam-column. The effects of rotatory inertia has also been included. The model takes into account two distinctly different wave speeds - a faster one for axial and bending deformations and a slower one for the shear deformation. The second part is a scheme for the stress analysis of a typical disc-vertebra interface for a given dynamic moment, shear and axial force. (Modified author abstract) GRA

N74-21730# School of Aerospace Medicine, Brooks AFB, Tex.
RECENT ADVANCES IN OPERATIONAL AEROSPACE

MEDICINE Aeromedical Review
Royce Moser, Jr. Jan. 1974 24 p refs
(AD-774118; SAM-Review-1-74; SAM-TR-74-3) Avail: NTIS CSCL 06/5

The review provides Air Force flight surgeons information regarding recent advances in operational aerospace medicine. Material was selected for inclusion which deals with the more common problems confronting practicing flight surgeons. The review discusses advances in the administrative, clinical, research, environmental health, and education areas of aerospace medicine. It represents one aspect of continuing education in aerospace medicine for the flight surgeon. Author (GRA)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-21731 Centre Chirurgical Marie-Lannelongue, Paris (France). Lab. de Physiopathologie et Inst. Bolivien de Biologie d'Altitude.
ENERGY BALANCE DURING THE MUSCULAR EXERCISE IN MAN Final Report
Jeanne Raynaud Dec. 1972 29 p refs In FRENCH; ENGLISH summary
(Contract DGRST-69-0-1285)
Avail: Issuing Activity

At the onset of exercise, O2 flow returning to the lungs from the periphery transiently exceeds rest and steady state exercise values. This shows a delayed utilization of O2. At a given mechanical power, the relative part played by creatine phosphate is identical at sea level and high altitude, but anaerobic glycolysis is more important. The anaerobic threshold occurs at a lower mechanical power at high altitude. Maximum blood concentration of the growth hormone is closely related to the initial O2 deficit. Thermoregulatory reactions are as effective at high altitude as at sea level; however, sweating rate is higher in spite of a decrease of cutaneous blood flow. Author (ESRO)

N74-21732*# Rancho Los Amigos Hospital, Inc., Downey, Calif.
DEVELOPMENT OF AN EXTERNALLY POWERED PROSTHETIC HOOK FOR AMPUTEES Final Project Report, 27 Mar. 1971 - 30 Apr. 1973
Andrew Karchak, Jr., James R. Allen, and Ernest L. Bontrager 30 Apr. 1973 63 p refs
(Contract NAS8-27020)
(NASA-CR-120213) Avail: NTIS HC $6.25 CSCL 06E

The powered hook with trigger finger appears to be a useful adaptation of a terminal device for an amputee when performing vocational activities involving the use of a powered tool requiring a trigger control. The proportional control system includes transducers and amplifiers and appears to have widespread application for control of any external power, whether it be in the orthotic or prosthetic field. Author

N74-21733# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
[ON WASTE PRODUCT LOADING OF WATERS AND WASTE WATER PURIFICATION] [ZUR ABFALLSTOFFBELASTUNG VON GEWAESSERN UND ZUR ABWASSERREINIGUNG]
Peter E. M. Schneider Jan. 1974 53 p refs In GERMAN
(Ber-2-1974) Avail: NTIS HC $5.75

A literature survey is presented on problems of water pollution and self reclamation methods. It is shown that current flow plays an important role in the turbulent transfer of surface oxygen into deeper water layers and thus to natural waste conversion by living organisms. The amount of oxygen available to living organisms in deep water is strictly dependent on current patterns. Transl. by G.G.

N74-21734*# Scientific Translation Service, Santa Barbara, Calif.
WALKING IN OPEN SPACE
G. Titov Washington NASA Apr. 1974 10 p Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 1, Jan. 1974 p 34-35
(Contract NASw-2483)
(NASA-TT-F-15526) Avail: NTIS HC $4.00 CSCL 05E

A description is given of the operations involved when walking in space. These include assembly, maintenance and repair of different spacecraft equipment, changing crews of orbital stations, rescuing cosmonauts and spacecraft, and others. Author

N74-21735*# Kanner (Leo) Associates, Redwood City, Calif.
ERGONOMICS: A NEW SCIENCE FOR MAN
L. Chaynova Washington NASA Apr. 1974 7 p Transl. into ENGLISH from Tekhn. Molodezhi (Moscow), no. 12, Dec. 1973 p 18-19
(Contract NASw-2481)
(NASA-TT-F-15527) Avail: NTIS HC $4.00 CSCL 05E

The human operator's functions are analyzed in order to design machinery and plan for its efficient use. Electroencephalographs, electromyographs, electrocardiographs, electrooculogaphs, and an apparatus for measuring galvanic reactions of the skin are used to measure the operator's activity as he works at a stand simulating a machine. Data collected by computer are then used in the design of the actual machine. For example, a section of a chemical plant is reorganized by analyzing the existing situation and altering it accordingly. Subsequent results showed that improved man machine interfaces can drastically increase output. Author

N74-21736*# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
ENVIRONMENTAL CRITERIA FOR HUMAN COMFORT. A STUDY OF THE RELATED LITERATURE Final Report
Ira D. Jacobson Feb. 1974 113 p refs
(Grant NGL-47-005-151)
(NASA-CR-138144; BE-4088-101-74) Avail: NTIS HC $8.75 CSCL 05E

The data presented has for the most part been extracted from existing in-house and memoranda reports. The variables considered are motion, noise, temperature and pressure. The report is broken down into chapters for each of the environmental variables and criteria proposed based on the existing literature. Author

N74-21737*# Scientific Translation Service, Santa Barbara, Calif.
FLIGHT DICTATES TRAINING
R. Makarov Washington NASA Apr. 1974 10 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 2, 1974 p 44-45
(Contract NASw-2483)
(NASA-TT-F-15504) Avail: NTIS HC $4.00 CSCL 05E

A description is given of exercises to be used for training pilots and cosmonauts. The types of exercises and the equipment to be used are itemized. Author

N74-21738# Joint Publications Research Service, Arlington, Va.
A BAROMETER OF CONTROL
Boris Fedorovich Lomov and Valeriy Anisimov 22 Apr. 1974 11 p Transl. into ENGLISH from Tekhn. i Nauka (Moscow), no. 10, 1973 p 13-15
(JPRS-61807) Avail: NTIS HC $4.00

The interrelationship between the fields of cybernetics and engineering psychology is examined and specific implications of these sciences for human behavior are developed. Author

N74-21739*# Techtran Corp., Glen Burnie, Md.
STUDY OF THE OPERATIVE REST STATE IN MAN
K. S. Tochilov, V. M. Ukhin, and A. I. Shabanov Washington NASA May 1974 12 p refs Transl. into ENGLISH from Nerv. Sist. (USSR), no. 11, 1970 p 99-105
(Contract NASw-2485)
(NASA-TT-F-15564) Avail: NTIS HC $4.00 CSCL 06B

A four-hour laboratory test was conducted to study the physiological aspects of simple expectation of the presentation of emergency light and sound signals and such expectation accompanied by additional electric stimulation of the muscular nerves of the lower extremities. The results of the experiment

are presented and disucussed in the context of automation of labor. Author

N74-21740*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
POWER SPECTRAL DENSITY ANALYSIS OF THE ELECTROMYOGRAM FROM A WORK TASK PERFORMED IN A FULL PRESSURE SUIT Ph.D. Thesis - Houston Univ.
Earl V. LaFevers May 1974 89 p refs
(NASA-TM-X-58136; JSC-09004) Avail: NTIS HC $7.50 CSCL 06B

Surface electromyograms (EMG) taken from three upper torso muscles during a push-pull task were analyzed by a power spectral density technique to determine the utility of the spectral analysis for identifying changes in the EMG caused by muscular fatigue. The results confirmed the value of the frequency analysis for identifying fatigue producing muscular performance. Data revealed reliable differences between muscles in fatigue induced responses to various locations in the reach envelope at which the subjects were required to perform the push-pull exercise, and the differential sensitivity of individual muscles to the various reach positions; i.e., certain reach positions imposed more fatigue related shifts in EMG power than did others. It was found that a pressurized space suit changed the pattern of normal shirtsleeve muscle fatigue responses in all three of the muscles. Author

N74-21741*# Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
MECHANISMS OF DETERIORATION OF NUTRIENTS Annual Report, 13 Mar. 1973 - 13 Mar. 1974
Marcus Karel and James M. Flink 13 Mar. 1974 204 p refs
(Contract NAS9-12485)
(NASA-CR-134247) Avail: NTIS HC $13.25 CSCL 06H

Methods are reported by which freeze dried foods of improved quality will be produced. The applicability of theories of flavor retention has been demonstrated for a number of food polymers, both proteins and polysacchardies. Studies on the formation of structures during freeze drying have been continued for emulsified systems. Deterioration of organoleptic quality of freeze dried foods due to high temperature heating has been evaluated and improved procedures developed. The influence of water activity and high temperature on retention of model flavor materials and browning deterioration has been evaluated for model systems and food materials. Author

N74-21742*# Scientific Translation Service, Santa Barbara, Calif.
RESULTS OF MEDICAL AND BIOLOGICAL STUDIES PERFORMED DURING THE GEMINI AND APOLLO PROGRAMS: CHANGES IN THE WORKING CAPACITY OF THE ASTRONAUTS
Z. I. Kopanev and Ye. M. Yuganov Washington NASA Apr. 1971 34 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (USSR), no. 1, 1974 p 5-20
(Contract NASw-2483)
(NASA-TT-F-15503) Avail: NTIS HC $4.75 CSCL 05E

A survey of the literature on the psychosensory reaction of the astronauts, the flight programs carried out by them, and the results of postflight examinations employing various tests has shown that some astronauts noticed symptoms of a decrease in working capacity during space flights. Some of the problems involved in the prevention of unfavorable influences of spaceflight factors on the human organism are discussed. Author

N74-21743# Joint Publications Research Service, Arlington, Va.
PROBLEM OF ENGINEERING-PSYCHOLOGY EXPERIMENT AND ITS INSTRUMENTATION
V. I. Butov 9 May 1974 14 p refs Transl. into ENGLISH from Vestn. Leningr. Univ. (Leningrad), no. 23, 1973 p 77-86
(JPRS-61942) Avail: NTIS HC $4.00

Theoretical and practical bases are given for methods to construct experimental models to be used for laboratory reproduction or prediction of human operator performance in man machine systems. Author

N74-21744# European Space Research Organization, Paris (France).
CURRENT RESEARCH WORK AT THE INSTITUTE FOR AEROSPACE MEDICINE
Mar. 1974 276 p refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973
(ESRO-TT-35; DLR-FB-73-15) Avail: NTIS HC $17.00; DFVLR, Porz, West Ger. 64 DM

Results of experimental research are reported. The following topics are dealt with: selection and work load of air crews; effects of transmeridian flights on circadian rhythms, vibration, acceleration, and weightlessness; and hyperbaric and underwater medicine and technology. For individual titles, see N74-21745 through N74-21758.

N74-21745 European Space Research Organization, Paris (France).
WING ANOMALIES IN THE FLOUR BEETLE TRIBOLIUM CONFUSUM CAUSED BY SIMULATION OF WEIGHTLESSNESS
W. Briegleb et al *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 1-15 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aud dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 7-19 (For availability see N74-21744 13-05)

The beetles' eggs were cultivated in 4 mm tubes, and the results were examined after 3 generations. A highly significant morphogenetic effect with a radiomimetic character was observed. In particular, teratogene wing anomalies were observed, similar to a spontaneous mutation, and with similar characteristics as those of beetles flown in Biosatellite 2. ESRO

N74-21746 European Space Research Organization, Paris (France).
A NEW METHOD FOR RECORDING THE HEART AND RESPIRATORY RATES OF COCKPIT CREWS IN FLIGHT
H. Bruner et al *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 17-31 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 21-33 (For availability see N74-21744 13-05)

A method is described for inflight recording of heart and respiratory rate of pilots, by means of nose-clip transducers, in order to determine the total flight stress during short flights, and especially the psychophysical stress during take-off and landing. The sensors contain phototransistors for heart rate and NTC resistors for respiratory rate. The recording is done on a 12 decade printer at minute intervals. An example is given of a printout of heart and respiratory rate for pilot and copilot during approach and landing. ESRO

N74-21747 European Space Research Organization, Paris (France).
RELATIONS BETWEEN SOCIOMETRIC VARIABLES AND CRITERIA OF PROFICIENCY OR BEHAVIOR IN TRAINEE PILOTS
S. Fichtbauer *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 33-53 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 35-54 (For availability see N74-21744 13-05)

Some hypotheses about positive relations between sociometric variables (choice for group-leader, choice for friend, coherence of group) and criteria of proficiency or behavior (flying proficiency, application to duties, emotional stability) were tested on two samples of student pilots at a civil flight training center. The data from the first sample were gathered at the end of final training, the data from the second one at the end of an early phase of training. Author (ESRO)

N74-21748 European Space Research Organization, Paris (France).
A NEW METHOD FOR SALVAGING SUNKEN SHIPS AND WORKING UNDER WATER AT GREAT DEPTHS
H. D. Fust *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 55-70 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aud dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 55-67 (For availability see N74-21744 13-05)

The method combines diving bell and caisson techniques, and can be used to recover wrecks of maximally 20 m length, 4 m width, and 25 m height. An underwater crew compartment is foreseen for longer periods of work (6, 11, and 21 days). The first operation planned is salvaging a Viking ship at 5 m water depth, at the sea bottom. The problems of the application of this method at greater depth (30 to 50 m), in connection with an underwater station were investigated. Observations were made concerning the safety measures necessary in case of long period work in an overpressure environment. ESRO

N74-21749 European Space Research Organization, Paris (France).
PSYCHODIAGNOSTIC PROBLEMS IN THE SELECTION OF AVIATION PERSONNEL IN DEVELOPING COUNTRIES
K. M. Goeters *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 71-105 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 69-102 (For availability see N74-21744 13-05)

Forty three subjects applying for three aviation occupations (pilot, air traffic controller, and technician) from the developing Yemen Arabic Republic were tested with psychological tests for seven cognitive abilities and two personality traits. Problems of test selection application are discussed. Normative data and reliabilities of the tests are reported. The structure of the cognitive performances and of the personality scores are analyzed (partially with the help of a factor analysis). Author (ESRO)

N74-21750 European Space Research Organization, Paris (France).
CONCENTRATION TASKS UNDER PSYCHICAL STRESS
H. Kirsch *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 107-122 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aud dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 103-115 (For availability see N74-21744 13-05)

Resulting factors of simple search and arithmetic problems were examined. The concentration stress test (CST) of Kirsch was applied. The test consisted of ten working columns, each of which is given one minute to work. Here the working times are changed so that initial working time is prolonged, while the working time for each column is steadily shortened. This resulted in an increasing time-stress which leads to a significant decrement of achievement below expected value with a sample of 300 applicants. Reliability and validity coefficients are given for the CST as a testing procedure in the selection of pilot applicants. Author (ESRO)

N74-21751 European Space Research Organization, Paris (France).
THE RESYNCHRONIZATION OF DIAN PERFORMANCE RHYTHMS FOLLOWING TRANSMERIDIAN FLIGHTS
K. E. Klein et al *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 123-139 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 117-132 (For availability see N74-21744 13-05)

The phase shifts in diurnal performance rhythms were observed in two groups of 8 students after transmeridian flights. It was found that the phase resynchronization takes between 4 to 5 days, and is of an exponential character. Its speed is determined by the following factors: the direction of the flight (west-east resynchronization took longer than vice-versa), the nature of the tested biologic functions, and activity modes of the subject after the flight. ESRO

N74-21752 European Space Research Organization, Paris (France).
A CASE OF EXTREME AIR EMBOLISM AND ITS SUCCESSFUL TREATMENT IN A HYPERBARIC CHAMBER
H. Oser *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 141-159 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 133-149 (For availability see N74-21744 13-05)

The successful treatment of a patient suffering from massive aeroembolism with ambient hyperbaric air is investigated. Such treatment was accomplished using a hyperbaric chamber which medical personnel could enter for care and control of the patient. The condition of the patient and the success of the therapy during the compression-, isopression- and decompression phase are described. Some criteria of the hyperbaric treatment are discussed, and recompression-tables for the treatment of caisson disease are recommended. It is shown that even in nearly hopeless cases of aeroembolism a hyperbaric treatment can still be successful. Author (ESRO)

N74-21753 European Space Research Organization, Paris (France).
THE GLUTAMIC ACID METABOLISM OF THE BRAIN AND ITS MODIFICATION THROUGH HYPERBARIC OXYGENATION
G. Schaefer *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 161-175 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15 DFVLR, 1973 p 151-168 (For availability see N74-21744 13-05)

In brain extracts, the concentration of L-glutamic acid, gamma-amino-butyric acid (Gaba), and L-glutamine is significantly changed after breathing pure oxygen for about 70 hours. The reduction of the glutamic acid level occurring simultaneously with an increase of Gaba-concentration indicates an induction of inhibitory regulative mechanisms, whereas the elevation of the glutamine content seems to be an indication that larger amounts of ammonia are metabolized or detoxicated through O2 breathing. Author (ESRO)

N74-21754 European Space Research Organization, Paris (France).
PHYSICAL PRINCIPLES AND APPLICATION OF 0-G SIMULATION ACCORDING TO H. J. MULLER
A. Schatz et al *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 177-193 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-Fb-73-15, DFVLR, 1973 p 169-182 (For availability see N74-21744 13-05)

The theory of weightlessness simulation is developed for a single body system and applied to a simple cell mode. The conditions for good simulation are discussed and results show these conditions can be fulfilled without difficulties. Modifications of the model necessary for a further approximation to biology are described. Author (ESRO)

N74-21755 European Space Research Organization, Paris (France).
A CONTRIBUTION TO THE DIAGNOSIS AND PROGNOSIS OF THE PILOT'S BEHAVIOR UNDER PSYCHICAL STRESS
K. Steininger *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 195-214 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 183-200 (For availability see N74-21744 13-05)

The prognosis of the resistance to any psychologically impairing stress is considered in view of its importance in selecting pilot applicants. The chance of predicting such complex behavior as stress reactions depends on the correlations between certain personality factors, the intensity of individually experienced feeling of stress, and the specific features of several psychical disorders. It should be possible to identify some personality factors as specific risk factors for the occurrence of certain psychical failures or disorders. Author (ESRO)

N74-21756 European Space Research Organization, Paris (France).
THE INTERRELATIONSHIP BETWEEN GRAVITY AND MECHANICAL IMPEDANCE IN SUPINE HUMANS
L. Vogt et al *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 215-236 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-Fb-73-15, DFVLR, 1973 p 201-220 (For availability see N74-21744 13-05)

Measurements of the mechanical impedance of the supine human body under sustained acceleration were conducted to investigate the nonlinearities of the body system. A hydraulically driven shake table was installed on a centrifuge, and the

transmitted force acceleration of the platform on which the subject was lying, were recorded. The results show that sustained acceleration stiffens the human body with increasing + G sub x and shifts the resonance to higher values. The results are explained by way of a multidegree-of-freedom system. This contributes to a better insight into the behavior of the human body under high amplitude vibration, buffering, and impact environments. Author (ESRO)

N74-21757 European Space Research Organization, Paris (France).
CHANGES IN THE 24-HOUR RHYTHM AFTER TWO TRANSATLANTIC FLIGHTS IN RAPID SUCCESSION
H. M. Wegmann et al *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 237-253 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 221-235 (For availability see N74-21744 13-05)

The effects of two transatlantic flights in rapid sequence upon the 24-hour rhythm of body functions and performance were studied in 8 male subjects. Studies were made of outgoing and return flights between Frankfurt and Chicago with a time shift of 6 hours and a stopover time of 26 hours. The results and their operational significance for flying personnel are discussed. Author (ESRO)

N74-21758 European Space Research Organization, Paris (France).
THE EFFECT OF DEFINED SHOCK WAVES ON EXPERIMENTAL ANIMALS
O. Wuensche et al *In its* Current Res. Work at the Inst. for Aerospace Med. (ESRO-TT-35) Mar. 1974 p 255-270 refs Transl. into ENGLISH of Aktuelle Forschungsarb. aus dem Inst. fuer Flugmed., DLR-FB-73-15, DFVLR, 1973 p 237-252 (For availability see N74-21744 13-05)

In connection with the problems of high speed impact, the special effect of shock waves transmitted through different materials upon miniature pigs were investigated. In particular, those typical and reproducible injuries of organs which are caused by defined shock waves on predetermined body regions are described. In discussing the morphological findings, the particulars of the special damage effects were considered. Author (ESRO)

N74-21759# Human Engineering Labs., Aberdeen Proving Ground, Md.
HELHAT 2 - SCOUT CREW/OBSERVER TARGET DETECTION FLIGHT TESTS
Jan. 1974 23 p
(AD-773686; HEL-TN-1-74) Avail: NTIS CSCL 05/10

The HELHAT 2 flight test compared the target detection capability of helicopter scout crews and single observers flying in an OH-58 Kiowa at above the ground levels of 80 to 300 feet. An ancillary test employing six crews, gave some information on the target detection capability of scout crews in the nap-of-the-earth flight reign, 1 to 30 feet. Author (GRA)

N74-21760# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EVALUATION OF ARTERIAL OXYGEN CONCENTRATION IN HUMANS EXPOSED TO Gz Gx ACCELERATION FORCES Final Report
F. M. Holden and D. B. Rogers Nov. 1973 17 p refs
(AF Proj. 7222)
(AD-773827; AMRL-TR-73-81) Avail: NTIS CSCL 06/1

The study describes the development of a candidate dynamic model to predict arterial oxygen concentrations based on the dynamics of ventilation and perfusion. Measurements from humans and animals exposed to centrifugation are used to define the physiological parameters. Both steady state and dynamic changes in oxygen saturation due to Gz and Gx acceleration are considered. The reliability of the predictions of the model are verified and its value relative to aerial combat performance set forth. Author (GRA)

N74-21761# Stanford Univ., Calif. Electronics Labs.
BIOCYBERNETIC FACTORS IN HUMAN PERCEPTION AND MEMORY Semiannual Report, 1 Jun. - 30 Nov. 1973
David C. Lai Nov. 1973 58 p refs
(Contract DAHC15-72-C-0232; ARPA Order 2190)
(AD-773393; TR-6741-2) Avail: NTIS CSCL 05/10

The primary concern of the research project is the development of biocybernetic concepts and techniques required for the analysis and development of skills useful for the manipulation and control of memory functions, particularly those related to the more concrete (eidetic) images. In particular, the authors are concentrating on the problem of achieving biocybernetic expansion of human visual memory through the use of real-time computerized monitoring and feedback of cues that serve as keys to memory encoding and retrieval. The approach represents a more or less logical extension of the considerable evidence that the human nervous system depends heavily upon spatial and temporal cues both in the encoding and decoding of memories, especially sensory images. GRA

N74-21762# Logicon, Inc., San Diego, Calif.
AUTOMATED FLIGHT TRAINING (AFT). GCI/CIC AIR ATTACK Final Report, Feb. 1972 - Jul. 1973
John P. Charles, Robert M. Johnson, and Jay R. Swink Nov. 1973 129 p
(Contract N61339-72-C-0108)
(AD-772593; SDR-140; NAVTRAEQUIPCEN-72-C-0108-1) Avail: NTIS CSCL 05/9

A feasibility demonstration of the application of automated-adaptive training techniques for air-to-air intercept training in a flight simulator was conducted. The training task included three phases: (1) a climb task under GCI/CIC control, (2) an attack phase under RIO control and a steering dot display, and (3) a descent phase also under GCI/CIC control. Sidewinder-type missile intercepts including head-on, forward-quarter, and beam runs were incorporated into a training syllabus. Atmospheric turbulence, aircraft configuration, and bank angle were employed as adaptive variables. Performance was objectively measured for each phase, and the syllabus was restructured (on-line) based on that performance. (Modified author abstract) GRA

N74-21763# School of Aerospace Medicine, Brooks AFB, Tex.
DEVELOPMENT OF THE USAF SCHOOL OF AEROSPACE MEDICINE (USAFSAM) PORTABLE THERAPEUTIC LIQUID OXYGEN (LOX) BREATHING SYSTEM Final Report, Jan. 1969 - Feb. 1973
Constance R. Sturim Dec. 1973 12 p
(AF Proj. 4054)
(AD-772697; SAM-TR-73-47) Avail: NTIS CSCL 06/11

The USAFSAM portable therapeutic liquid oxygen (LOX) breathing system was designed to meet an urgent operational requirement to provide a portable, low pressure, therapeutic oxygen system for use on multimission aeromedical aircraft that do not have an integral therapeutic oxygen system. Specifications required that the systems be safe, compact, lightweight, and self-contained. They were to be capable of delivering therapeutic oxygen at rates from 8 to 10 liters per minute to two patients simultaneously for a minimum of 6 hours. Compatibility of the system with all USAF approved ventilatory, resuscitative, and inhalation therapy equipment was required. The evaluations indicated the portable LOX system performed the function for which it was designed in a satisfactory manner and recommended it be standardized for routine use in Air Force aeromedical evacuation missions. (Modified author abstract) GRA

N74-21764# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
AN IMPROVED CARDIOTACHOMETER INPUT CIRCUIT FOR HEART RATE DETERMINATION
Adolf R. Marko, Arthur G. Nielson, and Thomas H. Ebert Sep. 1973 29 p refs
(AF Proj. 7222)
(AD-773812; AMRL-TR-73-50) Avail: NTIS CSCL 06/1

Electronic data processing of electrocardiogram signals for determining heart rate requires signals with a minimum of interference and amplitude or wave form variations. In many environmental stress research experiments, the electrocardiogram signal is disturbed by movement artifacts, muscle action potentials, power line frequency interference, and other electrical noise sources. Computer programming techniques may be used to improve the accuracy of heart rate determinations under noise interference but requires valuable computer capability. A

comparatively inexpensive cardiotachometer input circuit has been developed that delivers a standard pulse of constant width and amplitude for every R-wave of the electrocardiogram. The circuit may also be useful to improve accuracy and reliability of cardiotachometers and cardiac alarm devices. Detail function and operation description, performance tests, and results from on line application are presented in the report. (Modified author abstract) GRA

N74-21765# California Univ., Irvine.
BIOCYBERNETICS: AN INTERACTIVE MAN-MACHINE INTERFACE Annual Technical Report, 1 Jan. - 31 Dec. 1973
R. F. Thompson and T. J. Taylor 20 Feb. 1974 45 p refs
(Contract DAHC15-72-C-0121; ARPA Order 1001)
(AD-774987) Avail: NTIS CSCL 05/8

The research reported involves the detection of human bioelectric phenomena that have been made analogues of ongoing cognitive processes and the utilization of these phenomena to control and/or communicate with external devices. The technique is applicable to situations requiring rapid human intervention in the control of complex systems operation. The major advantage of this project is the virtually automatic control of systems by the trained subject. GRA

N74-21766# Educational Testing Service, Princeton, N.J.
DEVELOPMENT AND VALIDITY OF A VOCATIONAL AND OCCUPATIONAL INTEREST INVENTORY
Gary J. Echternacht, Richard R. Reilly, and Patty J. McCaffrey Dec. 1973 81 p refs
(Contract F41609-72-C-0030; ILIR Proj. 00-12)
(AD-774573; AFHRL-TR-73-38) Avail: NTIS CSCL 05/9

Over 3,100 airmen and 300 recruits in basic training returned interest inventories, termed the Vocational and Occupational Interest Choice Examination (VOICE). Items forming the inventory were primarily generated by examining job analyses in relation to the airman classification structure. Both a priori and occupational scales were developed based on responses obtained by mail inventory administration of airmen who indicated satisfaction with their career fields. Scales were developed on half-samples and a cross-validation technique employed. A comparison was made, in order to assess validity, of the number of individuals correctly predicted to be members of a service career field or men-in-general using the scales versus the number of individuals one would expect to correctly predict without use of the scales. Scale weights developed in one half-sample were applied to responses obtained in the other half-sample in the above comparison. (Modified author abstract) GRA

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-21767 Stanford Univ., Calif.
STUDY OF VIBRATIONAL NONEQUILIBRIUM PHENOMENA IN CO-N2 MIXTURES DISTURBED BY RADIATIVELY DRIVEN RESONANT ACOUSTIC WAVES Ph.D. Thesis
Wen- Chang Peng 1973 106 p
Avail: Univ. Microfilms Order No. 74-6526

Theoretical and experimental studies of vibrational nonequilibrium phenomena in CO-N2 mixtures, disturbed by a periodical input of infrared radiation were carried out. Special attention is placed on the coupling of molecular transport effects with vibrational nonequilibrium in the deduction of the V-V relaxation time for CO-N2 from the measurements. The study begins with general formulations including both V-T and V-V energy transfers and three types of molecular transport effects: shear viscosity, thermal conduction, and vibrational diffusion. The system of governing equations is simplified with the aid of the long tube approximation and solved by means of finite Hankel transforms. Special limiting cases of molecular equilibrium and of vibrational nonequilibrium with only one active V-T transfer are obtained. Dissert. Abstr.

N74-21768 Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction Scientifique des Materiaux.
SUPERFICIAL INTERACTIONS AT THE CARBON FIBER/ORGANIC POLYMER INTERFACE Final Report [ETUDE DES INTERACTIONS SUPERFICIELLES A L'INTERFACE ENTRE FIBRES DE CARBONE ET POLYMERES ORGANIQUES]
Colette Belinski, Genevieve Grenier, and Francois- Xavier Lalau-Keraly Apr. 1973 20 p refs In FRENCH
(Contract DGRST-72-7-0084)
Avail: Issuing Activity

The surface reactivity of carbon fibers by vapor phase chromatography for molecular affinity prediction is presented. The carbon fibers were Courtaulds MT, MTU, and MTS with or without oxidation. For the MTU type an experiment was conducted using CCl4 extraction. The adsorption heats, isostenic heats, specific adsorption surfaces, and load loss in the chromatographic column were determined for a variety of organic materials from consideration of the retention volumes. Extrapolation to zero concentration leads to the enthalpies. The results are discussed in terms of oxidation influence on adhesion of fibers to organic matrices and affinities. The methods used are shown to be useful as simple and quick tests to ascertain the presence of impurities on raw fibers and predict the affinity of a sample material in respect to fibers. The study also permits the determination of adequate treatments for surface cleaning of the fibers. ESRO

N74-21769 Rhone-Poulenc-Textile, Lyon (France). Dept. de Physique et Chimie.
DETERMINATION OF CORRELATION BETWEEN THE ADHESION CHARACTERISTICS OF SYNTHETIC FIBERS TO RESINS AND THE SURFACE AND STRUCTURAL PROPERTIES OF THESE FIBERS Final Report [DETERMINATION DES RELATIONS ENTRE LES CARACTERISTIQUES D'ADHESION DES FIBRES SYNTHETIQUES AVEC DES RESINES ET LES PROPRIETES SUPERFICIELLES ET STRUCTURALES DE CES FIBRES]
Apr. 1973 23 p In FRENCH
(Contract DGRST-72-7-0323)
Avail: Issuing Activity

The importance of the adsorption/diffusion phenomena and thermodynamic compatibility for ethylene glycol terephtalate/preadhesive was determined. The experimental conditions were specified and the conetic aspects of the phtalate transfer to the polyester or wire were dealt with in regard to production plant techniques. The synthesis and study of new fiber generating polymers containing active sites for fiber/matrix joining by covalent bonds was studied with regard to attaining the highest mechanical properties. ESRO

N74-21770 Institut National de Recherche Chemique Applique, Paris (France). Dept. de Chimie Physique.
INVESTIGATIONS ON THE ROLE OF SOLID PARTICLES IN THE SO2 INTO SO4 OXIDATION IN THE ATMOSPHERE Final Report [RECHERCHES SUR LE ROLE DES PARTICULES SOLIDES DANS L'OXYDATION DE SO2 EN SO4 DANS L'ATMOSPHERE COMPTE RENDU DE FIN DE CONTRAT]
Courtecuisse, M. Saint-Yrieix, and M. Sibutpinote Mar. 1973 22 p refs In FRENCH
(Contract DGRST-71-7-2765)
Avail: Issuing Activity

The role of solid iron oxide particles in the oxidation of sulfur dioxide is presented. It is shown that SO2 solutions are oxidized following a two step process. First the oxides are attacked and iron ions appear in the solution, then the dissolved oxygen reacts on the SO2 with the iron ions acting as catalysts. A kinetic model for the reaction is presented and comparisons between laboratory results and in situ observations are discussed with regard to pH influence, and ion concentration on oxidation velocity. ESRO

N74-21771# California Inst. of Tech., Pasadena. Environmental Quality Lab.
CONTROL OF GASOLINE VAPOR LOSSES FROM STATION AND VEHICLE FILLING
Kenneth Heitner May 1973 15 p refs

(Grant NSF GI-29726)
(EQL-Memo-5) Avail: NTIS HC $4.00

Control technologies and hardware are being developed for gasoline vapor losses. Several alternative methods have been evolved to solve the problem. The cost of these control systems is considerably less than new vehicle controls already required by law and can be absorbed with a very slight increase in the price of gasoline. In air basins where additional reductions of hydrocarbon emissions are required to achieve state and Federal ambient air quality standards for oxidant, gasoline (and other organic) vapor losses can be controlled through regulations similar to the San Diego Rule 63. Author

N74-21772*# Linguistic Systems, Inc., Cambridge, Mass.
THE CREATION OF A STABLE pH GRADIENT IN A NONELECTROLYTE BUFFER SOLUTION MIXTURE. THE USE OF THIS SYSTEM FOR THE ISOELECTRIC FOCUSING OF ALBUMIN AND HEMOGLOBIN
G. V. Toritskiy, V. P. Zovyalov, and V. M. Abramov Washington NASA Apr. 1974 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk. SSR (USSR), v. 214, no. 4
(Contract NASw-2482)
(NASA-TT-F-15567) Avail: NTIS HC $4.00 CSCL 07D

The creation of a stable pH gradient in a nonelectrolyte buffer solution mixture, and the use of this system for isoelectric focusing of albumin and hemoglobin is discussed. Figures depict the dependence of the pH of a buffer mix on the concentration of organic solvents, and the isoelectric spectra of proteins in rabbit hemoglobin and human serum albumin. Author

N74-21773*# Scientific Translation Service, Santa Barbara, Calif.
POLAROGRAPHIC INVESTIGATION OF SLAGS. REPORT 2
S. S. Ognyanik Washington NASA 16 Apr. 1974 10 p refs Transl. into ENGLISH from Ukr. Khim. Zh. (Ukrainia SSR), v. 30, no. 4, 1964 p 337-341
(Contract NASw-2483)
(NASA-TT-F-15459) Avail: NTIS HC $4.00 CSCL 07D

The polarograms of the oxides of tin, cerium, and copper dissolved in dilute sodium borosilicate are given. It was established that there is a linear dependence between the diffusion current and the concentration of the oxide in the melt. Author

N74-21774*# Techtran Corp., Silver Spring, Md.
WORKS CONCERNING SILICA AEROGELS Progress Report
M. Cantin Washington NASA Dec. 1973 14 p ref Transl. into ENGLISH of "Etat d'Avancement des Travaux sur les Aerogels de Silice", Rept. SEP/SES-73/R.26-MC/fs Centre d'Etudes Nucl. de Saclay, France, Apr. 1973 p 1-11
(Contract NASw-2485)
(NASA-TT-F-14790; SEP/SES-73/R.26-MC/fs) Avail: NTIS HC $4.00 CSCL 07C

The use of silica aerogels as Cerenkov converters are presented within the overall framework of a brief general background of the problem. Opacity measurements and conclusions regarding the sample sizes used are included. Author

N74-21775*# Techtran Corp., Glen Burnie, Md.
IMPROVEMENTS APPLIED TO METHODS OF PREPARING INORGANIC AEROGELS
J. T. Stanislas, J. Teichner, A. N. Gilbert, and A. Nicolaon Washington NASA Dec. 1973 13 p Transl. into ENGLISH from French Patent no. 130417 (30 Nov. 1969) 7 p
(Contract NASw-2485)
(NASA-TT-F-14791) Avail: NTIS HC $4.00 CSCL 07B

Methods for preparation of inorganic aerogels, especially of the silica variety, gels in which the dispersion medium is a gas or a vapor are discussed. Methods described were designed to enable speed in production, reduction of costs, and more diverse uses for aerogels. Author

N74-21776*# Worcester Polytechnic Inst., Mass. Dept. of Chemical Engineering.
FABRICATION OF A GLYCEROL FROM CO2 REACTION SYSTEM, SUPPLEMENT Supplement to Final Report
Alvin H. Weiss 26 Dec. 1973 25 p
(Grant NGR-22-017-023)
(NASA-CR-138132) Avail: NTIS HC $4.25 CSCL 07D

The fabrication, installation, and testing of a glycerol hydrogenation and a CO2 hydrogenation - CH4 partial oxidation units are reported. The glycerol system proved to be operational while the CO2 system was installed but not bought on operational steam. Author

N74-21777*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MICROWAVE SPECTRA OF SOME SULFUR AND NITROGEN COMPOUNDS
William F. White Washington NASA May 1974 105 p refs (NASA-TN-D-7450; L-9255) Avail: NTIS HC $4.50 CSCL 07D

A computer-controlled microwave spectrometer was used to catalog reference spectra for chemical analysis. The apparatus, software, and experimental procedures are described. Tables of absorption frequencies, peak absorption coefficients, and integrated intensities are included for 13 sulfur compounds, 14 nitrogen compounds, and 1 compound containing both sulfur and nitrogen. The frequency range covered was 26,500 to 40,000 MHz for most compounds and 18,000 to 40,000 MHz for some. Author

N74-21778# Atomic Energy Establishment, Cairo (Egypt).
PREPARATION OF CALCIUM FLUORIDE, MAGNESIA, ALUMINA, AND SPINEL REFRACTORIES
N. A. Haroun and G. I. Orabi 1973 16 p refs
(AREAEE-164) Avail: AEC Depository Libraries HC $3.00

Slip casting of crucibles and cylinders of CaF2, MgO, Al2O3, and spinel was investigated and optimum conditions were determined. NSA

N74-21779# Explosives Research and Development Establishment, Waltham Abbey (England).
A TITRATOR WITH AUTOMATIC END-POINT DETECTION FOR WATER DETERMINATIONS BY KARL FISCHER REAGENT
R. Durrant Apr. 1973 18 p refs
(ERDE-TN-90; BR36273) Avail: NTIS HC $4.00

A semi-automatic titrator, capable of determining concentrations of water of less than 0.1 percent in both liquid and solid samples is described. The apparatus was designed to eliminate or reduce factors having an effect on end-point stability so that a reproducible amperometric end-point is obtained. Some typical results for isoduyl pelamonate and ammonium peocklenates are included. Author (ESRO)

N74-21780# California Univ., Berkeley. Dept. of Mechanical Engineering.
MEASUREMENT OF NO AND NO2 IN COMBUSTION SYSTEMS
Robert W. Schefer, Ronald D. Matthews, Nicholas P. Cernansky, and Robert F. Sawyer Oct. 1973 22 p refs Presented at the Western States Sect., the Combustion Inst. 1973 Fall Meeting, El Segundo, Calif.
(Grant AF-AFOSR-2299-73; AF Proj. 6813)
(AD-774048; AFOSR-74-0139TR; WSCI-73-31) Avail: NTIS CSCL 07/4

The measurement of NO and NO2 was studied in a premixed opposed jet stabilized flame and in a simple turbulent diffusion flame using propane and air in both cases. Cooled and uncooled quartz and stainless steel gas sampling probes, with tips designed to provide aerodynamic quenching, were used and compared. Concentration measurements were made with a chemiluminescent nitric oxide detector modified for the additional measurement of total NO(x). (Modified author abstract) GRA

N74-21781# Columbia Univ., New York. Radiation Lab.
PHYSICS OF FREE ATOMS AND OPTICALLY PUMPED ELECTRONIC DEVICES Final Report, 1 Nov. 1971 - 31 Oct. 1973
W. Harper Dec. 1973 15 p refs
(Grant AF-AFOSR-2180-72; AF Proj. 9767)
(AD-774111; AFOSR-74-0086TR) Avail: NTIS CSCL 07/4

The authors have developed a simple method for analyzing light shifts of magnetic resonance frequencies for optically pumped

Zeeman multiplets. They have discovered an important new high-density regime for optically pumped alkali vapors. This regime will make possible the construction of cheap miniaturized magnetometers and, perhaps, gyroscopes. Powerful new methods to investigate non-P excited states of alkali atoms have been developed. Lifetimes and hyperfine structures of excited S, D and F states have been measured. (Modified author abstract) GRA

N74-21782# Cornell Univ., Ithaca, N.Y. Lab. of Plasma Studies.
RESEARCH ON MOLECULAR LASERS Annual Report, 1 Oct. 1972 - 30 Sep. 1973
George J. Wolga and Simon H. Bauer Nov. 1973 82 p refs
(Contract N00014-67-A-0077-0006; ARPA Order 660)
(AD-775328) Avail: NTIS CSCL 07/4

Molecular and chemical lasers were studied in the following areas: (1) Measurement of V yields V and V yields R, T rates among hydrogen halide molecules and the temperature dependence of the energy transfer rates previously determined for HF, DF, HF/CO2 DF/CO2 systems; (2) Vibrational relaxation studies of CO2 in the pressure range 1-100 atm; (3) Chemical laser studies of the reaction of atomic oxygen and acetylene, computer modeling of the CS2-O2 chemical laser system, and chemical laser studies of the reaction of C3O2 with oxygen; (4) Relaxation of CO2(001) and HF(v = 1) by collisions with H and F atoms; and (5) The influence of vibrational excitations on the reaction rate of atom exchange reactions HF(v) + D2 yields HD + DF. Author (GRA)

N74-21783# British Steel Corp., Sheffield (England). Information Services.
KINETIC OF REACTION BETWEEN LIQUID IRON OXIDE SLAGS AND CARBON
M. W. Davies, P. N. Smith, and G. S. F. Hazeldean Oct. 1973 19 p refs
(PB-225658/4GA; CAPL/SM/H/36/73) Avail: NTIS HC $3.00 CSCL 07D

The reactions between carbon and iron oxide bearing liquid slags are considered. Reduction by solid carbon is described, and kinetic results given for reactions with both graphite and a solid carbon based on coal. Results are reported of an X-ray fluoroscopy study into the interaction between liquid iron carbon droplets and slags. Decarburization of the iron was observed visually by means of an X-ray image. The importance of factors affecting the nucleation and growth of the product phases is emphasized. (Modified author abstract) GRA

N74-21784# Envirogenics Systems Co., El Monte, Calif.
DEVELOPMENT OF A REVERSE OSMOSIS MODULE FOR WASH WATER RECYCLING IN A SPACE ENVIRONMENT AT 165 DEGREES F Final Report, 3 Apr. 1973 - 3 Jan. 1974
R. W. Lawrence, Robert A. Tidball, and C. W. Saltonstall, Jr. 3 Jan. 1974 20 p
(Contract DI-14-30-3221)
(PB-226632/8GA; Rept-0218-F; Int-OSW-RDPR-74-905) Avail: NTIS HC $3.00 CSCL 07A

A spiral wound module containing blend cellulose di- and triacetate membrane was evaluated at 300 psig in real laundry water for 17 days at 165 F using a series of 30, 0.9 and 0.2 micron clarification filters. Throughout the test period, the rejections of detergent, lactic acid, ionic species, and total dissolved solids were above 98% at product recoveries ranging from 50 to 86%. A prototype system processing 27 gal of wash water in 8 hrs or less was constructed and tested. The addition of urease enzyme to laundry water at 74 C was shown to be a feasible method for reducing urea content. GRA

N74-21785# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF REAL GAS PROPERTIES FROM TABLES OF TRIGONOMETRIC FUNCTIONS
K. A. Kairutdinov 4 Feb. 1974 14 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (USSR), vol. 24, no. 4, Apr. 1973 p 735-739
(AD-775120; FTD-HT-23-922-74) Avail: NTIS CSCL 07/4

A series of numerical examples is used to show the possibilities of applying numerical differentiation methods to tables of thermodynamic functions. GRA

N74-21786# Rocketdyne, Canoga Park, Calif.
INORGANIC HALOGEN OXIDIZER RESEARCH Annual Report, 1 Apr. - 31 Dec. 1973
K. O. Christe, C. J. Schack, R. D. Wilson, E. C. Curtis, and D. Pilipovich 26 Feb. 1973 163 p refs
(Contract N00014-70-C-0294)
(AD-774925; R-9454) Avail: NTIS CSCL 07/2

The authors have continued to study the use of PtF6 for the synthesis of novel, high-oxidation state species. Several XeF5(+) salts were characterized by 19F nmr and vibrational spectroscopy, and force fields were computed. A novel and interesting reaction between O2(+) salts and various halogen fluorides was discovered. A novel halogen perchlorate, the Cs(+)Br(ClO4)2(-) salt, was discovered and its structure was established by vibrational spectroscopy. A new and improved synthesis of anhydrous metal perchlorates was discovered. Investigation of synthetic methods for the preparation of the Rocketdyne discovered fluorocarbon perchlorates was continued. Work on the low-temperature ozonization of positive halogen compounds was completed. Numerous structural studies either have been completed or are under progress. The compounds studied include SF5Br, SF4, SF4O, ClF3O, CF3O(-), NF3O, and NF4(+) salts. (Modified author abstract) GRA

N74-21787# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE BALANCE EQUATIONS FOR A MIXTURE OF GRANULAR MATERIALS Technical Summary Report
S. L. Passman Jan. 1974 22 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-775584; MRC-TSR-1390) Avail: NTIS CSCL 07/4

Balance laws for constituents of a mixture of a finite number of granular materials are given. It is shown that the resulting balance laws for the mixture as a whole generalize those previously given for a single granular material. Author (GRA)

N74-21788# Aerospace Corp., El Segundo, Calif.
DEVELOPMENT OF THE MESA SPECTROSCOPY EXPERIMENT Technical Report, Mar. 1972 - Feb. 1973
Munson A. Kwok, Robert R. Giedt, and Robert H. Ueunten 15 Jan. 1974 46 p refs
(Contract F04701-73-C-0074)
(AD-774565; TR-0074(4534)-3; SAMSO-TR-74-2) Avail: NTIS CSCL 07/4

A spatially, spectrally, rapidly scanning spectrograph has been constructed for the study of specific properties of the supersonic free jet of a continuous HF chemical laser. The spontaneous emission from the HF 3 to 0 band is monitored. Details of the construction, spectroscopic theory, and data reduction nomograph are discussed. Effects of a nonuniform radiating gas are considered. Sample data are exhibited. Author (GRA)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-21789 British Broadcasting Corp., Kingswood (England). Research Dept.
WALSH-HADAMARD TRANSFORMATION OF TELEVISION PICTURES
R. Walker and C. K. P. Clarke Mar. 1974 11 p refs
(BBC-RD-1974/13) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The basic theoretical background of Walsh-Hadamard transformation is elaborated and a method by which the process may efficiently be carried out on real time television signals is reported. The use of such a transformer, augmented by signal measurements carried out in non-real time, is described. The

use of the technique as a means of television bit rate reduction is discussed. Author

N74-21790 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL SOUND SIGNALS: SUBJECTIVE EFFECT OF TIMING JITTER
W. I. Manson Mar. 1974 8 p refs
(BBC-RD-1974/11) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Apparatus has been built to simulate the effect of timing errors in a sound p.c.m. system. Tests have been carried out to enable tolerance limits to be estimated for both sinusoidal and random jitter on high-quality monophonic programs. Tolerances are proposed for jitter on a practical sound system, based on the results of the present work and other previous investigations. The tolerance varies from a timing jitter amplitude of 3.5 milliseconds (r.m.s.), for sinusoidal variation over a period of 50 seconds or more, to 35 nanoseconds for jitter frequencies of 2 kHz or higher. Comparable figures apply to timing jitter with a random-noise variation. Author

N74-21791 British Broadcasting Corp., Kingswood (England). Research Dept.
COMPUTER PROGRAMS FOR UHF CO-CHANNEL INTERFERENCE PREDICTION USING A TERRAIN DATA BANK
R. W. King and J. H. Causebrook Feb. 1974 30 p refs
(BBC-RD-1974/6) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A set of computer programs has been written to predict the interference caused by co-channel stations to the service of a television transmitter. These programs use geographical and transmitter information stored permanently on a magnetic drum. An outline is given of the methods employed by the programs. Details are given of the required input and the form of output. Author

N74-21792 British Broadcasting Corp., Kingswood (England). Research Dept.
HADAMARD TRANSFORMATION: A REAL-TIME TRANSFORMER FOR BROADCAST STANDARD PCM TELEVISION
R. Walker Feb. 1974 10 p refs
(BBC-RD-1974/7) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The requirements and design of a modular Walsh-Hadamard transformer for the real time transformation of broadcast quality p.c.m. television are discussed. Although the example given is for a transform size of 32 picture elements, the modular approach allows any size of transformer to be constructed, using similar units. This experimental transform system includes the means by which the data describing the transform might be modified in order that investigations into the properties and behaviour of the Walsh-Hadamard transform may be carried out, together with facilities for causing random errors in the transform signal. Author

N74-21793# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
SOLAR RADIO DATA, DECEMBER 1973
Dec. 1973 13 p
Avail: NTIS HC $4.00
For abstract, see N74-21795.

N74-21794# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
SOLAR RADIO DATA, FEBRUARY 1974
Feb. 1974 14 p
Avail: NTIS HC $4.00
For abstract, see N74-21795.

N74-21795# Ceskoslovenska Akademie Ved, Ondrejov. Ondrejov Observatory.
SOLAR RADIO DATA, NOVEMBER 1973
Nov. 1973 16 p refs
Avail: NTIS HC $4.00

The medians of the base level flux are given for 3 hour periods. The daily value is obtained by taking the mean of these values. Incomplete intervals at the beginning of observations are included only if longer than half of this period. Author

N74-21796*# Scientific Translation Service, Santa Barbara, Calif.
INFLUENCE OF STATICALLY UNEVEN UNDERLYING SURFACE UPON RADIATION CHARACTERISTICS OF PHASED ANTENNA ARRAY
A. L. Ayzenberg and B. V. Shatokhin Washington NASA Apr. 1974 11 p refs Transl. into ENGLISH from Radiotekhn. (Moscow), v. 28, no. 5, 1973 p 49-54 Sponsored by NASA
(NASA-TT-F-14787) Avail: NTIS HC $4.00 CSCL 17B

Under the approximations of geometric optics, expressions were obtained for the average observation range and its dispersion. Graphs were constructed which characterized the deterioration of the directional properties of the scanning array, whose observation range is formed with the use of an underlying surface having differing conductivity, in the case of vertical and horizontal polarizations of radiation, and different vertical dimensions of the antenna array in the wavelengths. The irregularities distort the observation range and decrease the antenna directivity. Calculations of the observation range dispersion show that the main distortions are observed in the region of the side lobes. Raising the observation range main lobe upwards reduces the influence of the irregularities. Author

N74-21797*# Kanner (Leo) Associates, Redwood City, Calif.
RESTORATION OF THE SHAPE OF ANALOG SIGNALS BY DISCRETE READINGS
V. P. Yevdokimov and L. I. Kolesnikov Washington NASA Apr. 1974 16 p refs Transl. into ENGLISH of "Vosstanovleniye Formy Analogovykh Signalov po Diskretnym Otschetam", Acad. of Sci. of the USSR, Inst. of Space Res., Moscow, report Pr-135, 1973 19 p
(Contract NASw-2481)
(NASA-TT-F-15546; Pr-135) Avail: NTIS HC $4.00 CSCL 17B

The model of a signal employing a set of possible correlation (spectral) functions is introduced. Restoration of the shape of a continuous signal by discrete readings using line filtration is examined. The precision criterion is the root-mean-square error of the restoration of the shape of the signal between readings. Line filters with finite storage (restoring functions) of increasing complexity are examined, as well as an optimal, physically unrealizable line filter. Restoration errors are calculated for different interrogation frequencies (the number of points in the correlation interval) and different restoring functions. Tables and graphs are presented for comparing errors, evaluating the utility of increasing filter complexity, and selecting filter type. Author

N74-21798*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Electrical Engineering Dept.
THE INFLUENCE OF POLARIZATION ON MILLIMETER WAVE PROPAGATION THROUGH RAIN Interim Report
C. W. Bostian, W. L. Stutzman, Paris H. Wiley, and R. E. Marshall 1 Jan. 1974 247 p
(Grant NGR-47-004-091)
(NASA-CR-138150; IR-2) Avail: NTIS HC $15.50 CSCL 20N

The influence of polarization on millimeter wave propagation through rain is investigated. The experimental equipment consisted of a 1.43 km line-of-sight path with 4-foot diameter dual-polarized parabolic reflector antennas at each end. Linearly polarized 17.65 GHz signals were transmitted with the electric field vectors at plus 45 degrees and minus 45 degrees from the vertical. These polarizations were initially chosen to maximize the measured depolarization at any given rainfall rate. Later it was discovered that the cross polarization levels measured with plus or minus 45 degree linearly polarized signals are theoretically the least sensitive to variations in drop canting angle and this choice of polarization reduces the scatter in the data. Author

N74-21799*# Sensory Systems Lab., Tucson, Ariz.
TELEMETRY LINK FOR AN AUTOMATIC SALMON MIGRATION MONITOR Final Technical Report
Howard A. Baldwin and Robert W. Freyman Oct. 1973 24 p refs
(Grant NGR-03-041-008)

(NASA-CR-138152) Avail: NTIS HC $4.25 CSCL 17B

The antenna and transmitter described in this report were designed for integration into the remote acoustic assessment system for detection of sockeye salmon in the Bristol Bay region of the Bering Sea. The assessment system configuration consists of an upward directed sonar buoy anchored 150 ft below the surface and attached by cable to a spar buoy tethered some 300 ft laterally. The spar buoy contains a telemetry transmitter, power supply, data processing electronics, an antenna and a beacon light. Author

N74-21800# RAND Corp., Santa Monica, Calif.
SPEECH AS A MAN-COMPUTER COMMUNICATION CHANNEL
Rein Turn Jan. 1974 18 p refs
(P-5120) Avail: NTIS HC $4.00

The use of speech for man-to-computer as well as for computer-to-man communication is studied. The problem areas include interference by ambient noise, the variation of voice and speech characteristics with individual speakers, the present lack of complete knowledge of acoustic, linguistic and semantic aspects of computer processing of speech, as well as the processing requirements and cost associated with the latter. Author

N74-21801*# Santa Barbara Research Center, Goleta, Calif.
STUDY OF SPIN-SCAN IMAGING FOR OUTER PLANETS MISSIONS Final Technical Report
E. E. Russell, R. A. Chandos, J. C. Kodak, S. F. Pellicori, and M. G. Tomasko (Ariz. Univ.) 27 Feb. 1974 289 p refs
(Contract NAS2-7096)
(NASA-CR-114745) Avail: NTIS HC $17.50 CSCL 17B

The constraints that are imposed on the Outer Planet Missions (OPM) imager design are of critical importance. Imager system modeling analyses define important parameters and systematic means for trade-offs applied to specific Jupiter orbiter missions. Possible image sequence plans for Jupiter missions are discussed in detail. Considered is a series of orbits that allow repeated near encounters with three of the Jovian satellites. The data handling involved in the image processing is discussed, and it is shown that only minimal processing is required for the majority of images for a Jupiter orbiter mission. Author

N74-21802*# Scientific Translation Service, Santa Barbara, Calif.
THE VALIDITY OF THE RAYLEIGH EXPANSION
M. Neviere and M. Cadilhac Washington NASA Sep. 1973 10 p refs Transl. into ENGLISH from Opt. Commun. (Netherlands), v. 2, no. 5, Oct. 1970 p 235-238
(Contract NASw-2483)
(NASA-TT-F-14750) Avail: NTIS HC $4.00 CSCL 20N

A new method to investigate the diffraction of an electromagnetic wave by a grating of infinite conductivity is given. This method, based on a convenient conformal mapping, leads to a general discussion of the validity of the Rayleigh expansion. Author

N74-21803*# Analytical Systems Engineering Corp., Burlington, Mass.
THUNDERSTORMS AND GROUND-BASED RADIO NOISE AS OBSERVED BY RADIO ASTRONOMY EXPLORER 1 Final Report, 18 May - 17 Nov. 1972
Joseph A. Caruso and John R. Herman 5 Apr. 1974 63 p refs Submitted for publication
(Contract NAS5-23121)
(NASA-CR-138999) Avail: NTIS HC $6.25 CSCL 17B

Radio Astronomy Explorer (RAE) 1 data are analyzed to determine the frequency dependence of HF terrestrial radio noise power. RAE observations of individual thunderstorms, mid-ocean areas, and specific geographic regions for which concommitant ground based measurements are available indicate that noise power is a monotonically decreasing function of frequency which conforms to expectations over the geographic locations and time periods investigated. In all cases investigated, active thunderstorm regions emit slightly higher power as contrasted to RAE observations of the region during meteorologically quiet periods. Noise levels are some 15 db higher than predicted values over mid-ocean, while in locations where ground based measurements are available a maximum deviation of 5 db occurs. Worldwide contour mapping of the noise power at 6000 km for five individual months and four observing frequencies indicate high noise levels over continental land masses with corresponding lower levels over ocean regions. Author

N74-21804*# Northwestern Univ., Evanston, Ill.
MICROWAVE CONDUCTIVITY OF SLIGHTLY IONIZED GASES AND ELECTROMAGNETIC SCINTILLATIONS Final Report, 1 Jan. 1969 - 31 May 1972
David Mintzer May 1972 3 p refs Submitted for publication
(Grant NGR-14-007-071)
(NASA-CR-139000) Avail: NTIS HC $4.00 CSCL 07E

Two areas of research are briefly summarized. The first is concerned with calculating the conductivity of a slightly ionized gas. A method is proposed which involves an expansion of the Boltzmann collision operator (of the electron distribution function, involving the neutral gas-electron interactions) in powers of the electron-gas mass ratio. The second area of investigation focuses on the problem of a radio wave propagating through the interplanetary medium, taking account of the decreasing plasma density with distance from the sun. D.L.G.

N74-21805*# City Coll. of the City of New York. Communications Systems Lab.
DELTA MODULATION Final Report, 1 Jan. - 31 Dec. 1973
Donald L. Schilling 31 Dec. 1973 75 p refs
(Grant NGR-33-013-063)
(NASA-CR-134257) Avail: NTIS HC $6.75 CSCL 17B

The overshoot suppression algorithm has been more extensively studied. Computer generated test-pictures show a radical improvement due to the overshoot suppression algorithm. Considering the delta modulator link as a nonlinear digital filter, a formula that relates the minimum rise time that can be handled for given filter parameters and voltage swings has been developed. The settling time has been calculated for the case of overshoot suppression as well as when no suppression is employed. The results indicate a significant decrease in settling time when overshoot suppression is used. An algorithm for correcting channel errors has been developed. It is shown that pulse stuffing PCM words in the DM bit stream results in a significant reduction in error length. Author

N74-21806# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTER ANALYSIS OF THE FAN DOUBLET ANTENNA
J. A. Landt, F. J. Deadrick, E. K. Miller, and R. Kirchofer (HDL) 19 Oct. 1973 24 p refs Presented at EMP Tech. Meeting, Kirtland AFB, N. Mex., 25 Sep. 1973
(UCRL-74846; Conf-730935-3) Avail: NTIS HC $3.25

The EMP response of the fan doublet, an HF-VHF communications antenna that resembles a bow tie viewed from broadside, was measured using a biconic simulator that produces a peak field strength at the antenna of 5600 V/m. Computations for comparison with the experimental data were performed, modeling the antenna with an integral equation approach in the frequency domain and Fourier transforming the data to the time domain to determine the transient response of the antenna. Results were obtained for the antenna located in free space and over a finitely conducting ground plane, the latter employing a modified image approach based upon the Fresnel plane wave reflection coefficients to model the antenna-ground interaction. The effect of the ground reflected field is demonstrated. Effects of various load conditions are investigated using a time domain integral equation approach. Author (NSA)

N74-21807# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
PROGRESS IN RADIO SCIENCE IN FINLAND, 1972
1973 18 p
(S-60) Avail: NTIS HC $4.00

Brief reports of the activities in 1972 of commissions in the following areas are presented: radio measurements and standards; radio and nonionized media; ionosphere; radio astronomy; radio waves and currents; radio electronics and radio noise of terrestrial origin. The members of the committee are listed along with publications. ESRO

N74-21808# Kansas Univ. Center for Research, Inc., Lawrence.
A STUDY OF AFCS COMMUNICATIONS MEASUREMENT PROGRAM Final Report, 18 Feb. 1972 - 18 Feb. 1973
A. M. Breipohl, K. Sam Shanmugam, and Harvey Doemland Nov. 1973 95 p refs
(Contract F30602-72-C-0229)
(AD-775163; RADC-TR-73-312) Avail: NTIS CSCL 17/2

The objective of this work was to study the current measurement procedures used by the Air Force Communications Service (AFCS) for monitoring the performance capabilities of the microwave communications systems used by the Air Force and to develop additional measurement procedures to supplement the current procedures. The approach used to achieve the objectives consists of developing simple mathematical models for the various functional blocks in the communication system, selecting a set of important parameters of the model, relating values of functional block parameters to communications systems parameters, and developing procedures for measuring the values of these parameters. Author (GRA)

N74-21809# Stanford Research Inst., Menlo Park, Calif.
SATELLITE-VIEWED CLOUD COVER AS A DESCRIPTOR OF TROPOSPHERIC RADIO-RADAR PROPAGATION CONDITIONS Final Report, 1 Jan. 1969 - 31 Dec. 1973
Sidney M. Serebreny and Roy H. Blackmer, Jr. Feb. 1974 52 p refs
(Contract DAHC04-69-C-0065; SRI Proj. 7940)
(AD-775426; AROD-8242-1-GS) Avail: NTIS CSCL 20/14

Variations in the strength of received signal levels on tropospheric scatter radio-communication links were compared with atmospheric conditions along the propagation path as inferred from cloud cover photographed by meteorological satellites. The primary objective was to see whether changes in signal levels were related to satellite-viewed cloud cover. (Modified author abstract) GRA

N74-21810# Army Foreign Science and Technology Center, Charlottesville, Va.
MEASUREMENT OF RADIOTHERMAL AND PLASMA RADIATIONS IN THE SUPERHIGH-FREQUENCY RANGE
A. Y. Basharinov, L. T. Tuchkov, B. M. Polyakov, and N. I. Ananov 5 Mar. 1974 417 p Transl. into ENGLISH of the book "Izmerenie Radioteplovykh i Plazmennykh Izluchenii v SVCH Diapazone" Moscow, Sovetskoye Radio, 1968 390 p
(AD-774986; FSTC-HT-23-670-69) Avail: NTIS CSCL 20/14

This monograph gives a systematic presentation of the results of studies of the generation and transfer of natural superhigh-frequency radiations and the reception of superhigh-frequency broad-band signals in relation to the problem involved in propagation of radio waves, geophysics, radiometeorology and plasma physics. In addition to a generalization of the studies made by the authors and their associates, the monograph gives systematically processed material on the theoretical and experimental studies published prior to the middle of 1966. The monograph consists of four parts giving physical concepts concerning the mechanism of superhigh-frequency radiations, the results of studies of the superhigh-frequency radiation of different types of ground cover, the atmosphere and plasma formations, and considers the problems involved in signal reception and selection. GRA

N74-21811# Naval Postgraduate School, Monterey, Calif.
A VIDEO BANDWIDTH COMMUNICATIONS SYSTEM UTILIZING OPTICAL FIBER TRANSMISSION M.S. Thesis
Gary Michael Lockhart Dec. 1973 59 p refs
(AD-775013) Avail: NTIS CSCL 17/2

A video bandwidth communications system utilizing optical fiber transmission was designed, constructed, and tested. An amplitude modulated gallium arsenide light emitting diode is driven by a transistor circuit. The output is detected by a wide bandwidth silicon detector-preamplifier hybrid circuit. Properties such as bandwidth and harmonic distortion were measured for the individual system elements and the overall system. A closed circuit television signal was sent through the system and a sharp clear picture was observed on the monitor. Author (GRA)

N74-21812# Martin Marietta Aerospace, Orlando, Fla. Communications and Electronics Div.
AREA NODAL COMMUNICATIONS INVESTIGATION Final Report, Jan. - Jul. 1973
T. L. Duffield, J. C. Wiltse, and W. L. Elden Nov. 1973 310 p refs
(Contract F30602-73-C-0147; AF Proj. 4519)
(AD-775375; OR-12744; RADC-TR-73-341) Avail: NTIS CSCL 17/2

A comprehensive study of the capabilities in the millimeter wave and optical portions of the electromagnetic spectrum in an intrabase communications system environment was conducted, and the relative metits of each technology compared to developed the optimum intrabase communications system for postulated rapidly deployed command posts. The approach pursued was to compare the two technologies in a typical base deployment for projected communications needs of the 1980's. The investigation is based on a system composed of several hundred subscribers and several terminals. It considers systems that use information bandwidths in excess of 300 MHz and operate at maxmum ranges of 10 kilometers with 99.9 percent all-weather reliability. (Modified author abstract) GRA

N74-21813# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
FM/CW RADAR SIGNALS AND DIGITAL PROCESSING
Donald E. Barrick Jul. 1973 28 p refs
(AD-774829; NOAA-TR-ERL-283) Avail: NTIS MF $1.45; SOD HC $0.60 as C55.13 CSCL 17/9

The use and processing of the FM/CW signal for radar and acoustic sounder systems are examined. This signal--along with real-time digital processing via minicomputers--is currently being used by several groups for HF over-the-horizon radars. A comparative analysis of the different processing techniques for general radar applications has yet to be undertaken. This note therefore attempts to promulgate details of these techniques so that they may find use in other systems. An example involving an HF backscatter radar is used to permit the reader to see how the techniques are applied to an actual problem. (Modified author abstract) GRA

N74-21814# Army Engineer Topographic Labs., Fort Belvoir, Va.
THE PROPAGATION OF VERY SHORT RADIO WAVES THROUGH THE IONOSPHERE AND THE INVESTIGATION OF IONOSPHERIC MODELS
Frederick W. Rohde Aug. 1973 164 p
(DA Proj. 4A6-62707-D-853)
(AD-774840; ETL-RN-74-1) Avail: NTIS CSCL 17/2

The Research Note deals with propagation phenomena of very short radio waves in the ionosphere as they occur in radio links between earthbound stations and satellites. It is shown how the propagation of radio waves is affected by the ionosphere and how radio range measurements have to be treated in order to obtain the geometrical distance between the terminals of the radio link. Radio waves of several frequencies (225 MHz, 420 MHz, 450 MHz, and 1600 MHz) are quantitatively discussed, because these frequencies relate to the Sequential Collation of Range (SECOR) System and to the proposed Defense Navigation Satellite System (DNSS). GRA

N74-21815# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MILLSTONE HILL RADAR PROPAGATION STUDY: INSTRUMENTATION
Joseph C. Ghiloni 20 Sep. 1973 98 p refs
(Contract F19628-73-C-0002; DAHC60-71-C-0005; DA Proj. 7X2-63304-D-215)
(AD-775140; TR-507; ESD-TR-73-247) Avail: NTIS CSCL 17/9

The report describes the radar instrumentation used for satellite tracking. Particular emphasis is placed on the changes which were made to permit simultaneous monopulse tracking passively at UHF and actively at L-band and on other equipment modifications made in support of the Millstone Hill Propagation Study. Author (GRA)

N74-21816# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

STUDY OF SOURCE LOCATION ERROR BY COMPUTER SIMULATION Physical Sciences Research Papers
K. Toman and J. E. Martine 6 Nov. 1973 22 p refs
(AF Proj. 5631)
(AD-775069; AFCRL-73-0684; AFCRL-PSRP-574) Avail: NTIS CSCL 17/7

The location of sources of waves propagating with unknown speed above (electromagnetic, infrasonic, acoustic-gravity wave) or below (seismic wave) the surface of the earth may be deduced from time-of-arrival measurements made at four synchronized stations. In order to determine how errors in arrival time relate to errors in source location and signal velocity, a computational procedure was developed. The latter is aimed at finding the optimum network configuration for determining the most probable source location and velocity of a propagating signal from given errors of time-of-arrival measurements. (Modified author abstract) GRA

N74-21817# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
STUDY OF AN ADAPTIVE METHOD FOR RADAR MULTI-PATH ERROR REDUCTION Final Report, 1 Dec. 1972 - 30 Nov. 1973
Robert C. Phares and Peyton Z. Peebles, Jr. 31 Jan. 1974 59 p refs
(Contract N00014-71-A-0121-0004)
(AD-774963) Avail: NTIS CSCL 17/9

The purpose of this effort was to investigate possible realizations of a microwave signal processing method to eliminate multipath interference in angle tracking systems. The method treats the case of a direct return wave and a single multipath return wave from a target as a two target problem, and uses a two target signal processor to decouple the two signals and eliminate the multipath interference. Theoretical constraints and limitations on possible lossy and lossless processors were evaluated using scattering matrix formulation. General solutions for the processor element values were found, and these solutions were applied to specific operating situations. Using the scattering matrix relationships, it was found that in general, a lossy processor was possible, but a lossless processor was not. Based on these results, several hardware implementations for the processor were considered, and two complete designs were ultimately presented. (Modified author abstract) GRA

N74-21818# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
SYLLABLE DETECTION IN CONTINUOUS SPEECH
D. C. Sargent, K. P. Li, and K. S. Fu Oct. 1973 10 p Presented at Acoustic Soc. of Am. Meeting, Los Angeles, Calif., 30 Oct. - 2 Nov. 1973
(Grant AF-AFOSR-1776-69; AF Proj. 9769)
(AD-773776; AFOSR-74-0111TR) Avail: NTIS CSCL 05/7

Machine extraction of the acoustic correlates of stress presupposes the ability of the machine to dectect each syllable in a speech passage. Knowledge about the extent of the vocalic portion of each syllable is required for such correlates as syllable duration, or changes in intensity and voice fundamental frequency within the syllable. The syllable detection program described in this paper was developed to provide such syllable information. GRA

N74-21819# Technische Hochschule, Graz (Austria). Inst. fuer theoretische Physik und Reaktorphysik.
WAVE PROPAGATION BETWEEN EARTH AND IONOSPHERE TAKING INTO ACCOUNT DIFFERENT REGIONS OF GROUND CONDUCTIVITY AND A VARIABLE HEIGHT OF THE IONOSPHERE Final Technical Report, Jul. 1972 - Oct. 1973
Ernst Ledinegg Dec. 1973 100 p refs
(Contract DAJA37-72-C-3796; DA Proj. 200-61102-B-31E)
(AD-775477) Avail: NTIS CSCL 20/14

The report contains results of a continuation of researches on VLF wave propagation between earth and ionosphere in the polar region where the path of the RF signal passes above both the sea and the ice of Greenland. The aim of this investigation is to find an explanation in terms of analytical solutions of phase and amplitude anomalies observed by F. Reder and S. Westerlund. GRA

N74-21820# Chicago Univ., Ill. Lab. for Atmospheric Probing.
FLUCTUATION SPECTRUM AND VELOCITY STRUCTURE FUNCTION
Jaroslav Sychra 1 Jan. 1974 29 p refs
(Contract N00014-67-A-0285-0014; Grant DA-ARO(D)-31-124-71-G71; NR Proj. 061-188)
(AD-775533; AROD-9745-6-GS; TR-33) Avail: NTIS CSCL 17/9

An equation relating the fluctuation spectrum to the distribution of radial velocity differences of the scatterers, and the pulse volume illumination function is derived. Assuming that the radial velocity differences are due only to turbulence, the particles follow the air motions faithfully, the turbulence is homogeneous, and the reflectivity is constant, then it is shown that the variance of the fluctuation spectrum is a weighted average of the turbulence structure function, the weighting function being completely determined by the pulse volume illumination function. Various methods of estimating the structure function from measurements of the fluctuation spectrum variance are discussed. Author (GRA)

N74-21821# Mitre Corp., Bedford, Mass.
ESTIMATING THE COMMUNICATIONS COVERAGE FOR UHF GROUND-TO-AIR RADIO SYSTEMS
A. J. Desrosiers Jan. 1974 52 p refs
(Contract F19628-73-C-0001; AF Proj. 4510)
(AD-775142; MTR-2716; ESD-TR-73-353) Avail: NTIS CSCL 17/2

Estimating the coverage which can be obtained for reliable line-of-sight ground-to-air communications is difficult when relatively low power transmitters are employed and significant multipath fading is anticipated. An analysis and computer simulation of this problem is presented which can be used to determine coverage area as a function of many variables which include site elevation, aircraft altitude, type of terrain, polarization, frequency, and antenna characteristics. The propagation effects of refraction and divergence at small angles with respect to the horizon are included in the analysis. Author (GRA)

N74-21822# Bojarski (Norbert N.) Moorestown, N.J.
INVERSE SCATTERING Final Report
Norbert N. Bojarski Feb. 1974 20 p refs
(Contract N00019-73-C-0312)
(AD-775235) Avail: NTIS CSCL 20/14

The Physical Optics and Exact Inverse Scattering solutions of this author are summarized. For the Physical Optics Inverse Scattering Method, shown are computer-reconstructed images of a sphere and cylinder from computer synthetic scattering data, as well as a sphere from experimentally measured data. For the Exact Inverse Scattering Method, shown are computer-reconstructed source distributions (currents) of a half wave dipole antenna, a point-source, and two point-sources separated by one-half-wavelength, from computer synthetic scattering data. Author (GRA)

N74-21823# Naval Undersea Center, San Diego, Calif.
IMAGE TRANSMISSION VIA SPREAD SPECTRUM TECHNIQUES Quarterly Technical Report, 1 Jun. - 1 Oct. 1973
Robert W. Means, Jeffrey M. Speiser, and Harper J. Whitehouse 1 Oct. 1973 150 p refs
(ARPA Order 2303)
(AD-775234) Avail: NTIS CSCL 17/2

The report describes the progress on second phase of a program on image bandwidth reduction for application to the ARPA remotely piloted vehicle (RPV) problem of sending television images over spread spectrum cthannels. The report details the first quarter of a hardware development and implementation phase. Hardware was constructed to perform linear transformations on the television signal. Both surface acoustic wave and charge transfer devices were built and tested. It was decided to proceed with charge transfer devices for the final design. The study of performance tradeoff as a function of block size and transform was continued. It was determined that a Cosine transform together with a differential pulse code modulation (DPCM) transform in the second dimension offers near optimal performance. A principal result of this quarter is the determination that the DPCM and Cosine mixed transform are an optimal

performance system. A second result is that charge transfer device hardware has been built which approximates the final prototype hardware GRA

N74-21824# Naval Underwater Systems Center, New London, Conn.
THE PARAMETRIC RADIATOR AS A WIDEBAND CALIBRATION SOURCE
William L. Konrad and Joseph G. Navin 14 Jan. 1974 16 p
(NUSC Proj. A-614-12)
(AD-775287; NUSC-TR-4645) Avail: NTIS CSCL 17/1

The parametric, or difference frequency, radiator appears to offer advantages over conventional facilities used for hydrophone calibration: wide bandwidth from a single transducer, narrow beamwidths, and short pulse lengths. The combination of these characteristics promises simplification of calibration procedures and elimination or reduction of boundary-reflection problems. Experiments described measured the parametric-radiator performance for calibration purposes and highlighted its inherent problems. Author (GRA)

N74-21825# Cincinnati Electronics Corp., Ohio.
RADIO SET AN/PRC-70( ) Quarterly Progress Report, 1 Jan. - 31 Dec. 1973
C. A. Bucher Feb. 1974 36 p
(Contract DAAB07-71-C-0319; DA Proj. 1S6-674701-D-535)
(AD-775402; ECOM-0319-7; Rept-80045-PRC-39/174; QPR-7) Avail: NTIS CSCL 17/2

The report covers four quarterly intervals from 1 January 1973 through 31 December 1973. The effort during this calendar period has been directed primarily toward testing and troubleshooting of the engineering model. Appropriate design modifications growing out of this work were concurrently incorporated in the hardware under construction and the documentation for the ET/ST models. Highlight areas of the debugging and troubleshooting activities for this calendar period have been in the antenna coupler, receiver spurious responses and transmitter intermodulation. Construction and test of modules and subassemblies for the first group of three ET/ST models has also been a significant activity during this period. Author (GRA)

N74-21826# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
ELECTROMAGNETIC SCATTERING OF AN ARBITRARY PLANE WAVE BY TWO NON-INTERSECTING PERPENDICULAR WIRE GRIDS Scientific Interim Report
David A. Hill and James R. Wait 1 Nov. 1973 36 p refs
(AF Proj. 5635)
(AD-775070; AFCRL-TR-73-0690; SR-61) Avail: NTIS CSCL 20/14

A doubly infinite set of linear equations is derived for the currents excited on the pair of planar wire grids by a plane wave of arbitrary polarization. The equations can be solved by perturbation if the two planar arrays are sufficiently separated or by truncation and matrix inversion otherwise. The transmission coefficients are derived including the cross-polarized components, and numerical results are presented to illustrate the effects of various parameters. Author (GRA)

N74-21827# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Electrical Engineering/Electrophysics.
VHF-UHF SURFACE WAVE STUDIES Final Report, 1 Jul. 1971 - 30 Jun. 1973
H. L. Bertoni and T. Tamir Jan. 1974 58 p refs
(Contract DAAB07-71-C-0328; DA Proj. 1S6-62705-A-058)
(AD-775410; PIBEP-73-133; ECOM-0328-F) Avail: NTIS CSCL 09/1

An analysis of wedge and grating transducers for elastic surface waves is presented based on viewing the transducer as a surface-wave detector. The analysis is then used to find the design criteria and operating characteristics, such as efficiency and band-width, of grating transducers for Rayleigh waves. When operating as a detector, the surface wave incident on the portion of the substrate covered by the wedge or grating is converted into a leaky wave that radiates one or more beams into the wedge or substrate, one of which is detected by a bulk-wave transducer. Besides giving insight into the operation of these transducers, the analysis based on the detector point of view is valid for cases, such as the Rayleigh-wave grating transducer, where more than one radiated beam is present. The design and operating characteristics of grating transducers are determined. (Modified author abstract) GRA

N74-21828# Naval Postgraduate School, Monterey, Calif.
THE FEASIBILITY OF PULSE SIGNAL CLASSIFICATION BY SPECTRAL PARAMETERS M.S. Thesis
John Donald Meloy Dec. 1973 98 p refs
(AD-775030) Avail: NTIS CSCL 09/4

The paper explores the feasibility of fast transform coefficients as classification features for pulse type signals. The fast transforms investigated are Fourier (FFT), Walsh (FWT), and Haar (FHT). A synthesized signal base containing 79 distinct pulse shapes of similar duration is analyzed for classification information compactness in the discrete time, Fourier, Walsh, and Haar bases. Nonparametric information measures are used. It is concluded that a Fourier basis representation enables the significant reduction of dimensionality necessary for further study as a generator of classification features. Author (GRA)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-21829 Ernst-Mach-Inst., Freiburg (West Germany).
USE OF SIMPLE AUDIO TAPE RECORDERS FOR STORING OF DIGITALIZED ANALOG SIGNALS [EINSATZ EINFACHER TONBANDGERAETE ZUR SPEICHERUNG DIGITALISIERTER ANALOGSIGNALE]
S. Stots and M. Detterer 1973 17 p refs In GERMAN; ENGLISH summary
(Rept-7/73) Avail: Issuing Activity

A method for long term storage of digitalized analog signals on simple audio tape recorders of the cassette type is described. It can be used for continuous analog signals as they have high redundancy. On playback, recording errors can be detected and greatly corrected. The readout of the stored digital data can take place in digital form as well as in analog form after suitable conversion. At readout the faulty or erroneous data are marked and the number of errors counted. ESRO

N74-21830 Compagnie d'Applications Mecaniques a l'Electronique au Cinema et a l'Atomistique, Paris (France).
APPLICATIONS OF THE INFORMATICS TECHNIQUES ON THE CAMECA SCIENTIFIC INSTRUMENTS Final Report [RECHERCHE SUR L'APPLICATION DES TECHNIQUES DE L'INFORMATIQUE AUX INSTRUMENTS SCIENTIFIQUES CAMECA COMPTE RENDU DE FIN DE CONTRAT]
M. Dillenseger, M. Tong, and J. M. Rouberol Feb. 1973 11 p In FRENCH
(Contract DGRST-71-7-2639)
(Rept-90311/73) Avail: Issuing Activity

The final steps of the interfacing of a CAMECA ion mass spectrometer to a computer (12K words of 12 bits) are presented. The system is designed for control, data acquisition, and data reduction in real time. Hardware work concentrated on revision and finalization of interface circuits while the software for calibrating, mass number calculation, cyclic scanning and in-depth measurements were finalized and regrouped in a 12K memory. ESRO

N74-21831*# Information Research Associates, Inc., San Antonio, Tex.
SPECIFICATIONS AND PROGRAMS FOR COMPUTER SOFTWARE VALIDATION Final Report
J. C. Browne, R. Kleir, T. Davis, M. Henneman, A. Haller, and G. L. Lasseter 20 Nov. 1973 103 p
(Contract NAS8-28084)
(NASA-CR-120206) Avail: NTIS HC $8.25 CSCL 09B

Three software products developed during the study are reported and include: (1) FORTRAN Automatic Code Evaluation System, (2) the Specification Language System, and (3) the Array Index Validation System. D.L.G.

N74-21832# Defence Research Establishment Valcartier (Quebec).
GRAPHIC VISUALIZATION CONSOLE WITH VECTOR GENERATOR FOR THE PDP-8 COMPUTER [CONSOLE DE VISUALISATION GRAPHIQUE AVEC GENERATEUR DE VECTEURS POUR ORDINATEUR PDP-8]
P. E. Boutin and J. Dorland. Oct. 1973. 62 p. refs. In FRENCH; ENGLISH summary.
(DREV-TN-2039/73) Avail: NTIS HC $6.25

The system described in this document was designed for displaying on a large screen computer produced graphs. The programming flexibility of the computer is first used to break a picture into points or vectorial segments. The system acquires the picture data through a direct memory access channel, computes the intermediary points of vectors to be plotted, and transforms the numerical data into analog voltages driving the display screen. The system is able to draw about 400 inches of vectors or to plot 2500 points without flicker. Author

N74-21833*# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Electrical Engineering and Electrophysics.
DIGITAL COMMUNICATIONS STUDY Final Report, 1 Jan. 1972 - 1 Jan. 1973
Robert R. Boorstyn. 1 Jan. 1973. 102 p. refs.
(Grant NGR-33-006-020)
(NASA-CR-138129; PIBEE/EP-73-006) Avail: NTIS HC $8.25 CSCL 09B

Research is reported dealing with problems of digital data transmission and computer communications networks. The results of four individual studies are presented which include: (1) signal processing with finite state machines, (2) signal parameter estimation from discrete-time observations, (3) digital filtering for radar signal processing applications, and (4) multiple server queues where all servers are not identical. D.L.G.

N74-21834# National Bureau of Standards, Washington, D.C. Computer Systems Engineering Div.
COST-BENEFIT ANALYSIS OF COMPUTER GRAPHICS SYSTEMS
Ira W. Cotton. Apr. 1974. 49 p. refs. Sponsored by ECOM.
(NBS-TN-826) Avail: SOD HC $.90 C13.46:826

The state-of-the-art is assessed in cost benefit analyses of computer graphics systems, and an approach is suggested for developing improved methodology. Cost-benefit analyses are distinguished from analyses of system performance in that the latter are directed at optimizing system performance at a given level of investment, while the former are directed at justifying the investment itself. Computer graphic system design alternatives are first outlined. Then methods of analyzing the performance and costs of computer systems in general and graphic systems in particular are discussed. With this information it is shown how cost-effectiveness analyses may be performed. An experimental methodology is proposed for better performing benefit analyses of computer graphic systems. A more rigorous formulation of the cost-benefit procedure is then outlined. Author

N74-21835# RAND Corp., Santa Monica, Calif.
REMARKS ON THE INSTRUMENTATION OF DATABANK SYSTEMS FOR DATA SECURITY
Rein Turn. Jan. 1974. 10 p. refs. Presented at Workshop on Data Protection, Oberpfaffenhofen, West Germany, 24-26 Oct. 1973.
(P-5151) Avail: NTIS HC $4.00

Access control barriers are passive control mechanisms for delaying an intruder until other protective action can be taken. In order to alert and apply security reinforcements, it is necessary to implement an active security subsystem for detecting and diagnosing intrusion attempts in progress. Information requirements of the active security subsystem are discussed, as well as those for two other security functions - auditing and threat monitoring - and ways of instrumenting a databank system for obtaining this information are explored. Author

N74-21836# RAND Corp., Santa Monica, Calif.
TOWARD DATA SECURITY ENGINEERING
Rein Turn. Jan. 1974. 26 p. refs. Presented at Workshop on Data Protection, Oberpfaffenhofen, West Germany, 24-26 Oct. 1973.
(P-5142) Avail: NTIS HC $4.50

Data security engineering is a methodology for designing and implementing cost effective data protection mechanisms for specified databank systems. Included will be models of protective mechanisms, derivation of measurements of effectiveness, setting up and evaluating cost-effectiveness formulae, developing a calculus for handling complex structures of protective mechanisms, and deriving guidelines for implementation. General requirements and specific features of data security engineering are discussed. Author

N74-21837*# Radio Corp. of America, Burlington, Mass. Aerospace Systems Div.
DATA BUS SYSTEM DEVELOPMENT PROGRAM Technical Final Report
J. S. J. Harrison. Nov. 1973. 74 p. refs.
(Contract NAS9-12110)
(NASA-CR-134241; CR-72-588-030) Avail: NTIS HC $6.75 CSCL 05B

Two data bus systems were designed fabricated, Data Bus System I and Data Bus System II. The technical features of the delivered hardware include the following: (1) 5 MHz selfclocking data bus; (2) bidirectional communications utilizing Manchester Code at data rates in excess of 20,000 words per second; (3) utilization of MSI COS/MOS technology (4) probability of accepting an erroneous data bit less than 1 in 10 to the 25th power (5) low power consumption (50 to 1 reduction in quiescent current over P/MOS) (6) compatibility with projected high density packaging. Three distinct types of data bus remote terminals were developed: the subsystem interface unit, the combination of an electronic interface unit and a standard interface unit-serial, and an SIU/Preprocessor. Author

N74-21838*# Intermetrics, Inc., Cambridge, Mass.
THE GOAL-TO-HAL/S TRANSLATOR SPECIFICATION Final Report
Saul F. Stanten and James H. Flanders. 15 Dec. 1973. 172 p. refs.
(Contract NAS10-8385)
(NASA-CR-138159) Avail: NTIS HC $11.75 CSCL 09B

The specification sets forth a technical framework within which to deal with the transfer of specific GOAL features to HAL/S. Key technical features of the translator are described which communicate with the data bank, handle repeat statements, and deal with software interrupts. GOAL programs, databank information, and GOAL system subroutines are integrated into one GOAL in HAL/S. This output is fully compatible HAL/S source ready for insertion into the HAL/S compiler. The Translator uses a PASS1 to establish all the global data needed for the HAL/S output program. Individual GOAL statements are translated in PASS2. The specification document makes extensive use of flowcharts to specify exactly how each variation of each GOAL statement is to be translated. The specification also deals with definitions and assumptions, executive support structure and implementation. An appendix, entitled GOAL-to-HAL Mapping, provides examples of translated GOAL statements. Author

N74-21839*# TRW Systems Group, Redondo Beach, Calif. Analysis and Experiment Support Section.
LUNAR OBSERVATIONS VERIFIER EDITOR PROGRAMMER'S MANUAL, REVISION 1
E. L. Barnett. 19 Apr. 1974. 29 p.
(Contracts NAS9-8166; Proj. Skylab)
(NASA-CR-134258; TRW-11176-H415-RO-02; Rev-1; TRW-74-FMT-938-Rev-1) Avail: NTIS HC $4.50 CSCL 09B

The prime purpose of the programmer's manual is to aid the programmer in understanding the programming aspects of the program. A description of the input, the printout, the deck setup, and tape configuration may be obtained from the LOVE user's guide. Author

N74-21840# Defence Research Establishment Suffield, Ralston (Alberta).
AN INTERFACE BETWEEN A DIGITAL CONCENTRATION READOUT DEVICE AND A TELETYPE UNIT
L. A. Gau and J. F. Ross. Nov. 1973. 26 p.
(Memo-7/73) Avail: NTIS HC $4.50 CSCL 09B

Design and operation are reported of an interface system

between a digital concentration readout unit used for chemical analysis and a 5-level code teletype punch unit. It automatically produces a printout and paper tape punch of concentration data from the DCR on the teletype unit in a form suitable for direct input to a computer. Author

N74-21841# European Space Research Organization, Paris (France).
ON-BOARD COMPUTERS. TRENDS IN THE DEVELOPMENT FROM 1962-1972
Peter Nowak Feb. 1974 34 p refs Transl. into ENGLISH of Bordrechner-Entwicklungstendenzen in den Jahren 1962-1972, DLR-MITT-73-24, DFVLR, 1973
(ESRO-TT-26; DLR-MITT-73-24) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 13.30 DM

A survey of hardware trends, use and improvements in performance of on-board computers is made for the period 1962-1972. Tables on the performance of some well-known on-board computers are included and suggestions are made as to which aspects should be given particular consideration in designing new on-board computers for European space missions. ESRO

N74-21842# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
SOME ASPECTS OF DIMENSIONALITY AND SAMPLE SIZE PROBLEMS IN STATISTICAL PATTERN RECOGNITION
Anil K. Jain Aug. 1973 102 p refs
(Grant AF-AFOSR-2048-71; AF Proj. 9769)
(AD-774121; AFOSR-74-0088TR) Avail: NTIS CSCL 09/2

The report is concerned with obtaining relationships between the dimensionality of a measurement vector and the number of training samples available in order to maximize the performance of a pattern classifier. In statistical pattern classification, it is known that, in general, if the class-conditional densities are not completely known and only a finite number of training samples are available, then above a certain number of measurements, the performance starts deteriorating rather than improving steadily. Previous investigators have studied conditions under which this curse of finite sample size can be escaped and other properties of the optimal measurement complexity. However, all these results are valid only for the specific structural assumptions and optimal estimators and generalization to other situations had to be made heuristically. In the report, several rather general results pertaining to independent measurements and arbitrary estimators are derived. Author (GRA)

N74-21843# Army Missile Command, Redstone Arsenal, Ala.
GENERAL FREQUENCY RESPONSE PROGRAM FOR SMALL MEMORY CAPACITY COMPUTERS
James L. Baumann 30 Jul. 1973 25 p refs
(DA Proj. 1M2-62303-A-214)
(AD-773731; RG-73-15) Avail: NTIS CSCL 09B

The report describes a frequency response program written for small, desk-top digital computers, in particular the Hewlett Packard 9800 Model 20 with extended memory and plotter (if plotting is desired). The particular advantages of this program are (1) transfer functions can be inputted directly, requiring only that the transfer function be in the form of products of numerator polynomials over products of denominator polynomials; (2) the resultant frequency response can be quickly obtained and outputted in printout or various plot formats; and (3) the engineer has instant point-by-point access to the program and can quickly make parameter changes or signal program reruns. These features result in a General Frequency Response program that should handle most problems encountered, and its use could considerably reduce the cost of analysis and design efforts. Author (GRA)

N74-21844# Naval Ordnance Lab., White Oak, Md.
PLANFORM INPUT GENERATOR (PING), A NASTRAN PROCESSOR FOR LIFTING SURFACES: THEORETICAL DEVELOPMENT, USER'S MANUAL, AND PROGRAM LISTING Technical Report, Jul. 1971 - Jun. 1973
Pao C. Huang and John P. Matra, Jr. Dec. 1973 191 p
(UF32322501)
(AD-775303; NOLTR-73-199) Avail: NTIS CSCL 16/4

The Planform Input Generator (PING) presented in this report is pre-processor for NASTRAN analysis of lifting surfaces. Using PING, finite element models can be automatically generated and NASTRAN bulk data cards punched, thus enabling a complicated structure to be accurately and rapidly analyzed. General theoretical development user's manual, program listing and sample problems are included in the report. Author (GRA)

N74-21845*# Boulder Area Growth Study Commission, Colo.
EXPLORING OPTIONS FOR THE FUTURE: A STUDY OF GROWTH IN BOULDER COUNTY. VOLUME 3: ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES Final Report
Nov. 1973 388 p refs
(Grant NGL-06-003-200)
(NASA-CR-138177; PB-226265/7GA; CPA-CO-08-00-0111-3) Avail: NTIS HC $21.50 CSCL 13B

An environmental inventory of Boulder County and land use recommendations derived from the inventory are given. The inventory, which includes data on bedrock and surficial geology, vegetation, climate, soils, mineral and water resources, wildlife, and natural hazards, was compiled from existing data and augmented, where necessary, by information obtained from high altitude aircraft imagery. GRA

N74-21846# Army Construction Engineering Research Lab., Champaign, Ill.
USER MANUAL FOR LIFE1 COMPUTER PROGRAM Final Report
J. Willmer, P. McManus, and E. Marvin Jan. 1974 54 p refs
(DA Proj. 4A6-64717-D-895)
(AD-774849; CERL-TR-S-28) Avail: NTIS CSCL 09/2

The report describes a digital computer program that enables airfield-pavement designers and planners to analyze the consequences of available decision alternatives. The program allows different design schemes and strategies for maintaining the proposed pavement systems. Costs of construction and maintenance are estimated, and the various combinations of design schemes and maintenance strategies are ranked by total costs over the design-life of the pavement. Instructions are provided for program operation and input preparation for use with CDC 6000 series computer systems. The program is written in FORTRAN Extended. Author (GRA)

N74-21847# Battelle Columbus Labs., Ohio.
APPLICATION OF INTERACTIVE GRAPHICS TO THE AVIONICS EVALUATION PROGRAM Technical Report, 15 Jan. - 29 Jun. 1973
David W. Welp, Ronald A. Brown, Jerry L. Pittenger, and David A. Nippert Nov. 1973 62 p
(Contract F33615-72-C-2081; AF Proj. 6091)
(AD-775372; AFAL-TR-73-270) Avail: NTIS CSCL 09/2

A computer program for simulation and effectiveness evaluation of avionics for military aircraft has been developed and expanded for the purpose of providing the Avionics Laboratory with the capability of executing the Avionics Evaluation Program (AEP) via interactive graphics and to adapt the program for use on the Avionics Laboratory computer. The AEP is a very large computer program with extensive multidiscipline input data. There was a very clear need to provide an easier means of executing the program, storing potential input data, and graphically presenting results. During the contract extension Battelle's Columbus Laboratories have (1) procured interactive graphics equipment, (2) developed interactive software, (3) procured additional equipment for the Air Force Avionics Laboratory PDP 11 computer to support the interactive capability, and (4) made additional modifications to the AEP to enhance its capability and to make it compatible with the PDP 11 computer. This report presents a description of the resultant effort. GRA

N74-21848# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
NATURAL COMMUNICATION WITH COMPUTERS 4 Quarterly Progress Report, 1 Oct. - 31 Dec. 1973
Jan. 1974 75 p refs
(Contract DAHC15-71-C-0088)
(AD-775232; BBN-2721; QPR-13) Avail: NTIS CSCL 09/2

The authors report the details of progress on Natural Communications with Computers IV in the areas of Speech

understanding, distributed computation and TENEX improvements, language research, and speech compression. GRA

N74-21849# University of Southern Calif., Los Angeles. Image Processing Inst.
IMAGE PROCESSING SOFTWARE DOCUMENTATION
William K. Pratt, James M. Pepin, Guner Robinson, and Mark Sanders Dec. 1973 201 p
(Contract F08606-72-C-0008; ARPA Order 1706)
(AD-774969; USCIPI-500) Avail: NTIS CSCL 09/2

The report contains descriptions of image processing software developed by the University of Southern California Image Processing Institute. Also included are operational descriptions of the IBM 360/44 and the HP-2100 computer system used in image processing. Author (GRA)

N74-22122 Saab-Scania, Linkoping (Sweden).
COMPUTER PROGRAMME DOCUMENTATION
A. Carlsson and B. Schmidtbauer *In its* Satellite Attitude Control and Stabilisation Using On-board Computers Jul. 1973 p 391-438 (For availability see N74-22119 13-14)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-21850* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMAGE TUBE Patent
Kenneth L. Hallam (Bendix Res. Labs.) and Charles Bruce Johnson, inventors (to NASA) (Bendix Res. Labs.) Issued 23 Apr. 1974 6 p Filed 16 Oct. 1972 Supersedes N73-13214 (11 - 04, p 0395) Sponsored by NASA
(NASA-Case-GSC-11602-1; US-Patent-3,806,756;
US-Patent-Appl-SN-298157; US-Patent-Class-315-10;
US-Patent-Class-315-11; US-Patent-Class-315-12) Avail: US Patent Office CSCL 09E

An optical image is projected onto a planar surface of a photocathode that derives an electron beam replica of the image. A target electrode displaced relative to the photocathode so that it does not obstruct the optical image includes a planar surface for receiving and deriving an accurate replica of the electron beam image. The two planar surfaces are parallel. The electron beam image is focused on the target electrode by providing throughout a region that extends between the planar surfaces of the photocathode and receiving electrode, constant homogeneous dc electric and magnetic fields. The electric field extends in a direction perpendicular to the planar surfaces while the magnetic field extends along a straight line that intersects the photocathode and target electrode at an acute angle.
Official Gazette of the U.S. Patent Office

N74-21851* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BIO-ISOLATED dc OPERATIONAL AMPLIFIER Patent
Robert D. Lee, inventor (to NASA) Issued 14 May 1974 4 p Filed 30 Jun. 1972 Supersedes N72-27233 (10 - 18, p 2402)
(NASA-Case-ARC-10596-1; US-Patent-3,811,094;
US-Patent-Appl-SN-267862; US-Patent-Class-330-59;
US-Patent-Class-330-28) Avail: US Patent Office CSCL 09E

A bio-isolated dc operational amplifier is described for use in making bioelectrical measurements of a patient while providing isolation of the patient from electrical shocks. The circuit contains a first operational amplifier coupled to the patient with its output coupled in a forward loop through a first optic coupler to a second operational amplifier. The output of the second operational amplifier is coupled to suitable monitoring circuitry via a feedback circuit including a second optic coupler to the input of the first operational amplifier.
Official Gazette of the U.S. Patent Office

N74-21852# Lockheed Missiles and Space Co., Palo Alto, Calif.
ANTENNAS WITH ROTATING FIELD POLARIZATION
I. N. Kobranskii [1973] 13 p Transl. into ENGLISH from the book "Antenny" Moscow, Energiia, 1973 p 302-313
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A method for constructing dipole, horn, and spiral antennas with rotating field polarization in the microwave band is reported. The procedure is based on phase shifting and rotating two linearly polarized fields 90 degrees in space relative to each other. Range and reliability of detection in different atmospheric precipitation backgrounds are discussed. Author

N74-21853*# Kanner (Leo) Associates, Redwood City, Calif.
DESIGN AND MECHANISM ON AN AUTOCATHODE
H. Bessling Washington NASA Apr. 1974 24 p refs Transl. into ENGLISH of "Aufbau und Funktion einer Autokathode" DFVLR, Inst. fuer Energiewandlung und Elek. Antriebe, Stuttgart, DLR-FB-72-73, 1972 p 7-27
(Contract NASw-2481)
(NASA-TT-F-15565; DLR-FB-72-73) Avail: NTIS HC $4.25 CSCL 09A

The design of a test device for an autocathode is described and a theoretical investigation of the autocathode mechanism is given. The autocathode is located in the center of a discharge chamber with a cylindrical anode in a 100-e vacuum tank. The ignition of the autocathode requires special means and is also explained. The electron emission mechanism of this cathode was found as a field emission. Finally, the electrical field, the electron and ion current density was calculated in the cathode volume for a presupposed discharge current. Performance data are presented in tables and in diagrams. Author

N74-21854# Australian Post Office Research Labs., Melbourne.
SEMI-CONDUCTIVE INTERLAYER COMPOUND FOR CABLES
H. J. Ruddell Aug. 1973 7 p refs
(Rept-6824) Avail: NTIS HC $4.00

A semiconductive mastic suitable for use as an interlayer compound between a metallic sheathed cable and a semiconductive polymeric jacket was produced by adding 45% powdered graphite to Dussek T1731. Author

N74-21855*# Princeton Univ. Observatory, N.J.
DEVELOPMENT AND EVALUATION OF TELEVISION TUBES FOR SPACE ASTRONOMY Final Report
Lyman Spitzer 10 May 1974 12 p refs
(Contract NSR-31-001-127)
(NASA-CR-138169) Avail: NTIS HC $4.00 CSCL 09A

An improved vidicon image sensor for space astronomy applications is developed that features reliably sealed ultraviolet transmitting windows and achieves acceptable photocathode quantum efficiency on these MgF2 windows. New preamplifier designs improve the dynamic range by reduction of the readout noise. G.G.

N74-21856*# Ohio State Univ., Columbus. ElectroScience Lab.
RADIATION AND SCATTERING BY THIN-WIRE STRUCTURES IN THE COMPLEX FREQUENCY DOMAIN
J. H. Richmond Washington NASA May 1974 41 p refs
(Grant NGL-36-008-138)
(NASA-CR-2396; TR-2902-10) Avail: NTIS HC $5.25 CSCL 20H

Piecewise-sinusoidal expansion functions and Galerkin's method are employed to formulate a solution for an arbitrary thin-wire configuration in a homogeneous conducting medium. The analysis is performed in the real or complex frequency domain. In antenna problems, the solution determines the current distribution, impedance, radiation efficiency, gain and far-field patterns. In scattering problems, the solution determines the absorption cross section, scattering cross section and the polarization scattering matrix. The electromagnetic theory is presented for thin wires and the forward-scattering theorem is developed for an arbitrary target in a homogeneous conducting medium. Author

N74-21857*# Calspan Corp., Buffalo, N.Y. Electronics Research Dept.
PLANAR ELECTROLUMINESCENT PANEL TECHNIQUES Final Report
Charles Kerr (Astronics Corp.) and Robert E. Kell Feb. 1973 35 p
(Contract NAS5-10192)
(NASA-CR-139002; IM-2280-E-1) Avail: NTIS HC $4.75 CSCL 09E

Investigations of planar electroluminescent multipurpose displays with latch-in memory are described. An 18 x 24 in. flat, thin address panel with elements spacing of 0.100 in. was constructed which demonstrated essentially uniform luminosity of 3-5 foot lamberts for each of its 43200 EL cells. A working model of a 4-bit EL-PC (electroluminescent photoconductive) electrooptical decoder was made which demonstrated the feasibility of this concept. A single-diagram electroluminescent display device with photoconductive-electroluminescent latch-in memory was constructed which demonstrated the conceptual soundness of this principle. Attempts to combine these principles in a single PEL multipurpose display with latch-in memory were unsuccessful and were judged to exceed the state-of-the-art for close-packed (0.10 in. centers) photoconductor-electroluminescent cell assembly. Author

N74-21858*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF DETERMINING BOND QUALITY OF POWER TRANSISTORS ATTACHED TO BED SUBSTRATES Patent Applications
Thomas A. Telfer, inventor (to NASA) (GE) Filed 26 Apr. 1974 11 p Sponsored by NASA
(NASA-Case-MFS-21931-1; US-Patent-Appl-SN-464721) Avail: NTIS HC $4.00 CSCL 09A

A non destructive method is reported for testing the bond quality of transistor heat sink bonds by X-ray examination of the bond. The bond is X-ray photographed and the photograph is subjected to analysis by a light meter system to determine the percentage of voids in the bond. Void areas approaching 20% of the bond area can be tolerated if they are scattered. For repeatable results, X-ray of identical assemblies must be taken at identical machine settings. Since it is possible for lack of bonding not to show on an X-ray if the molten preform has conformed exactly to the bottom of the chip, the zing test for wetting should be used in conjuction with the X-ray test. NASA

N74-21859*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ISOLATED OUTPUT SYSTEM FOR A CLASS D SWITCHING-MODE AMPLIFIER Patent Application
Martial A. Honnell, inventor (to NASA) (Auburn Univ.) Filed 26 Apr. 1974 15 p Sponsored by NASA
(NASA-Case-MFS-21616-1; US-Patent-Appl-SN-464723) Avail: NTIS HC $4.00 CSCL 09E

A Class D amplifier is reported for the amplification of signals having uni-polar or bi-polar direct current, or alternating current. The device contains positive and negative signal channels and includes a transformer coupled output circuit for each channel with a switching circuit which effects isolation of the non-operating channel from the operating channel as a function of signal polarity. NASA

N74-21860# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
EUROPEAN MICROWAVE CONFERENCE, 1973
1973 18 p refs
(Rept-S-59) Avail: NTIS HC $4.00

Topics in the fields of microwave coupling, microwave transmission, microwave amplifiers, and microwave remote sensing are presented. For individual titles, see N74-21861 through N74-21864.

N74-21861 Helsinki Univ. of Technology, Otaniemi (Finland).
THE STRIPLINE COUPLING OF THIN-FILM JOSEPHSON JUNCTIONS TO EXTERNAL CIRCUITS AT MICROWAVE FREQUENCIES
Y. Sirkeinen, P. Somervuo, and T. Wilk *In its* European Microwave Conf. 1973 1973 4 p refs Sponsored in part by Tekniikan Edistamissaatio, Alfr. Kordelinin saatio and Kaupallisten ja teknillisten tieteiden tukisaatio (For availability see N74-21860 13-09)

Means of improving the coupling to a thin film tunneling junction in which a superconducting stripline is terminated to the edge of the junction, were investigated. Despite their narrow bandwidth capability and difficult coupling, tunnel type junctions were examined mainly because of experience in their reliable fabrication. The electrical and mechanical stability of the junctions was emphasized. Results show that the coupling method used is promising, although a relatively large mismatch still exists. ESRO

N74-21862 Helsinki Univ. of Technology, Otaniemi (Finland).
THE REALIZATION OF MICROWAVE BROAD-BAND AND NARROW-BAND TRANSISTOR AMPLIFIERS
S. Heikkilae *In its* European Microwave Conf. 1973 1973 4 p (For availability see N74-21860 13-09)

Some problems in the design and realization of a microwave transistor amplifier are discussed. The stability of a common emitter microwave transistor is looked at from the source and load impedance point-of-view and the operating frequency. The role of inductance, stray capacitance, and insertion loss is surveyed for a miniature microwave chip capacitor. An experimental amplifier is designed by computer optimization and analyzed by transmission line topology. It is shown that the fabrication accuracy of transmission line circuits, the variation of transistor parameters, and nonideal microwave capacitors must be taken into account in the design and realization of microwave transistor amplifiers above 2 GHz. Coupled line elements seem to be useful for matching. ESRO

N74-21863 Helsinki Univ. of Technology, Otaniemi (Finland).
MULTI-SLOT LINE, A NOVEL TRANSMISSION LINE FOR MICROWAVES AND MILLIMETERWAVES
M. Tiuri and L. Vaskelainen *In its* European Microwave Conf. 1973 1973 4 p refs (For availability see N74-21860 13-09)

A surface wave transmission multislot line is obtained by making parallel slots in a thin metal sheet. Multislot lines have several separate propagation ranges close to the frequencies where the length of the individual slot is an odd multiple of a half wavelength. The multislot line is a lightweight and cheaply fabricated slow wave structure for microwaves and mm waves. When the distance between the slots is relatively short (0.1 ... 0.15 lambda), a corresponding phase velocity of the order of 0.5 ... 0.3 light velocity is easily obtained giving relatively tight coupling of the energy to the structure. The attenuation at 2 GHz is around 0.1 db/m. ESRO

N74-21864 Helsinki Univ. of Technology, Otaniemi (Finland). **c13**
ANALYSIS OF DIELECTRIC PROPERTIES AND NOISE TEMPERATURE OF SEA ICE FOR MICROWAVE REMOTE SENSING APPLICATIONS
M. Hallikainen *In its* European Microwave Conf. 1973 1973 4 p refs (For availability see N74-21860 13-09)

The dielectric properties of sea ice were studied with regard to microwave radiometry, taking into consideration the effects of temperature, salinity, and frequency. The results obtained were used for calculating the noise temperature of sea ice. Calculations were based on experimental salinity profiles measured along the Finnish coast. The dielectric loss of sea ice depended strongly on frequency, salinity, and temperature above -10 C. Hence the passive method for mapping the characteristics of sea ice can be applied at low salinities if the local variations of the salinity profile are approximately known. ESRO

N74-21865# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
BURST PROCESSOR TAPPED DELAY LINE Interim Report, 1 Nov. 1972 - 1 Oct. 1973
H. M. Gerard, T. W. Bristol, E. H. Ross, and W. R. Smith Jan. 1974 82 p refs
(Contract DAAB07-72-C-0046; DA Proj. 7X2-63304-D-215) (AD-774281; FR-74-14-26; ECOM-0046-2; IR-2) Avail: NTIS CSCL 09/1

The object of the program is to develop and demonstrate a Doppler resolution filter configured as a tapped delay line. The device will operate at a center frequency of 220 MHz and a

50 MHz 1 db bandwidth. The Burst Processor Tapped Delay Line geometry will use a parallel channel approach such that each delay output is derived from a separate acoustic channel. The device employs double electrodes for both input and tapping (output) transducers; the input consists of a simple, periodic transducer with six (6) double electrodes, while the outputs use novel phase-reversal transducers with eleven (11) electrodes. The BPTDL also uses a 300 MHz reference channel which directly measures the time delay and controls the insertion phase by means of a temperature control system. The delay line design has been thoroughly analyzed and experimentally tested. Fabrication and evaluation of two prototype devices has been completed. (Modified author abstract) GRA

N74-21866# Rensselaer Polytechnic Inst., Troy, N.Y. Div. of Electrophysics and Electronic Engineering.
BEHAVIOR OF INJECTION LOCKED IMPATT AND FREE RUNNING TRAPATT OSCILLATORS UNDER TRANSIENT IONIZING RADIATION Final Report, 1 Dec. 1971 - 30 Jun. 1973
Sorab K. Chandhi, Jose M. Borrego, Ronald J. Gutman, and Henry J. Geipel 1 Nov. 1973 39 p refs
(Contract F19628-72-C-0112; AF Proj. 5710)
(AD-774676; AFCRL-TR-73-0682) Avail: NTIS CSCL 09/5

X-band injection locked IMPATT oscillators were exposed to 100-nanosecond pulses of 10 MeV electrons at dose rates between 3 x 10 to the 8th power and 3 x 10 to the 9th power rads/sec. During the radiation pulse, the RF power of the oscillator was found to be independent of the locking signal while the RF frequency shift depended upon the power of the locking signal. Original performance was regained within a few RF cycles following the radiation pulse. S-band TRAPATT diode pulsed oscillators were exposed to 100 nanoseconds pulses of 10 MeV electrons at dose rates between 2 x 10 to the 7th power and 4 x 10 to the 9th power rad/sec in both evacuated and air-filled cavities. The RF power is unaffected below a critical dose rate, which is typically between 8 x 10 to the 7th power and 2 x 10 to the 8th power rads/sec. Above this critical dose rate the RF power is almost quenched entirely during the radiation pulse, but recovers to the original level within 50 nanoseconds afterwards for all dose rates used. Rapid recovery of original RF power levels occurred when the radiation pulse occurred at the initiation of the 300 nanosecond RF TRAPATT pulse, in the middle of the TRAPATT pulse, or during the decay of the TRAPATT pulse. Author (GRA)

N74-21867# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
PRECISION SINGLE SIDEBAND CRYSTAL UNITS Semiannual Report, 1 May - 31 Oct. 1973
Raymond K. Hart Jan. 1974 73 p refs
(Contracts DAAB07-73-C-0172; DAAB07-73-Q-0184)
(AD-774284; GIT-A-1536-S; ECOM-0172-S) Avail: NTIS CSCL 09/1

The report is concerned with the systematic investigation of various cleaning and processing techniques which are used to assemble high precision single sideband (SSB) quartz resonators. The final requirement is to be able to produce crystal units which will meet a strict aging requirement of 2 x 10 to the minus 10th power/week, when measured at the upper turning point of the crystal unit after a stabilization period of 4 weeks. The specific aspects of resonator fabrication that have been investigated during this reporting period are several wet-cleaning processes for preparing quartz surfaces, the sputter-ion cleaning of quartz and the composition profiles and impurities associatied with both the quartz surface and the copper electrodes. (Modified author abstract) GRA

N74-21868# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
EXPERIMENTAL STUDIES OF A MULTIPLE MODE ARRAY TECHNIQUE FOR LIMITED SCAN APPLICATIONS Physical Sciences Research Papers
Robert J. Mailloux and George R. Forbes 6 Nov. 1973 31 p refs
(AF Proj. 4600)
(AD-775081; AFCRL-TR-73-0685; AFCRL-PSRP-575) Avail: NTIS CSCL 09/5

The report presents experimental data showing the limited scan capabilities of E-plane and H-plane horns and an eight-element array of E-plane horns. A theoretical discussion of scanning in two dimensions is included in the appendix. Author (GRA)

N74-21869# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN OVERLAPPED SUB-ARRAY FOR LIMITED APPLICATION
Robert J. Mailloux 27 Sep. 1973 19 p refs
(AF Proj. 4600)
(AD-775082; AFCRL-73-0598; AFCRL-PSRP-566) Avail: NTIS CSCL 09/5

An overlapped sub-array pattern is produced by higher order mode coupling between nearest neighbor phased array elements. Theoretical and experimental results are compared, and practical circuits described for one plane of scan. The appendix presents a circuit for scanning in two planes. Author (GRA)

N74-21870# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
RADIATION TOLERANCE OF GaAs BROADBAND AMPLIFIER Final Report, 1 Apr. - 30 Sep. 1973
Rainer Zuleeg and Allen F. Behle 31 Oct. 1973 43 p refs
(Contract F19628-73-C-0245; AF Proj. 6096)
(AD-775384; MDC-G5033; AFCRL-TR-73-0666) Avail: NTIS CSCL 09/5

The response and degradation characteristics of microstripline GaAs junction field-effect transistor integrated microwave amplifiers were investigated in radiation environments. Permanent changes in electrical performance due to fluences of 5 x 10 to the 14th power and 1 x 10 to the 15th power neutrons/sq cm (E = 10 KeV) are reported and discussed. Experimental results are compared with theoretical predictions of device transconductance changes, which have been established and verified prior to this investigation. (Modified author abstract) GRA

N74-21871# General Electric Co., Schenectady, N.Y.
MICROWAVE FIELD EFFECT TRANSISTOR DEVELOPMENT Final Technical Report
Herbert Goronkin Jan. 1974 80 p refs
(Contract F30602-72-C-0371)
(AD-775382; RADC-TR-73-374) Avail: NTIS CSCL 09/1

The purpose of the program was to fabricate a 10-watt F-Band field effect transistor. Two approaches were taken. The multiple mask approach was found to be cumbersome and generally difficult to execute for a 2.5 micron geometry device. Rather than pursue this approach, a second design was initiated which involved self-registration of the source and drain with respect to the gate by means of a selective epitaxial region which comprises the electrical channel. Due to several unanticipated process difficulties (for which solutions have been identified) time did not allow for completion of the fabrication portion of the FET-11 effort. Preliminary findings indicate that the approach is feasible and should be expected to yield microwave power field effect transistors. Author (GRA)

N74-21872# Corning Glass Works, Raleigh, N.C. Electronic Research Lab.
ULTRA-STABLE MICROWAVE CAVITY Final Technical Report
J. J. Pan and J. Singletary Oct. 1973 142 p refs
(Contract F30602-71-C-0183; AF Proj. 6523)
(AD-775363; P-4618-C; RADC-TR-73-310) Avail: NTIS CSCL 09/5

The report covers the development of a stable fundamental microwave source designed for tuning between 4.4 to 5.0 GHz with a tuning accuracy of better than plus or minus kHz. The stability, tunability, and tuning accuracy are derived from a low expansion, tunable, titanium silicate glass TE sub 011 mode cavity. Author (GRA)

N74-21873# Naval Postgraduate School, Monterey, Calif.
THE HYPOLE: A VERTICALLY POLARIZED HYBRID DIPOLE FOR APPLICATION IN LAND MOBILE AND SHIPBOARD COMMUNICATIONS M.S. Thesis
Herbert Bramwell Shaw, III Dec. 1973 59 p refs

(AD-775015) Avail: NTIS CSCL 09/5

A study was made of a unique feed system which was developed to improve the performance of typical half-wave vertical mobile communications antennas. Popular misconceptions concerning the absolute gain of such radiators are discussed. Since vehicular roof-sized ground planes limit the realizable gain of currently used half-wave whips, the goal selected was to decouple the radiator from these undersized ground planes. The Hypcle antenna which evolved is demonstrated to have adjustable input impedance which is easily matched, true half-wave dipole performance, and minimum gain and pattern degradation. Author (GRA)

N74-21874# Rantec Corp., Calabasas, Calif.
FABRICATION TECHNIQUES AND PRINCIPLES FOR FLAT PLATE ANTENNAS Final Report, May - Aug. 1972
Sep. 1973 32 p refs
(Contract DOT-TSC-390)
(PB-225865/5GA; DOT-TSC-NHTSA-73-7; DOT-HS-800969) Avail: NTIS HC $3.00 CSCL 09E

The report documents the fabrication techniques and principles selected to produce one and ten million flat plate antennas per year. An engineering analysis of the reliability, electrical integrity, and repeatability is made, and a cost analysis summary is included for a production run of both one and ten million units per year. finally, a technical discussion of the maximum RF frequency to which these fabrication techniques can be extended without performance degradation and/or major cost increase is included. GRA

N74-21875# Hughes Research Labs., Malibu, Calif.
INDUCTIVE ENERGY STORAGE SWITCHING TECHNOLOGY FOR HIGH REPETITION RATE LASERS Final Report, 1 May 1972 - 30 Apr. 1973
Mees H. Alting Aug. 1973 99 p refs
(Contract N60921-72-C-0306)
(AD-774911) Avail: NTIS CSCL 09/5

The basic objective of this program was to determine the feasibility of a particular Hughes switching concept in a high repetition rate laser power conditioning system using inductive energy storage (IES). A second objective was to compare a conventional capacitive system and an inductive system (using the Hughes switching concept) in order to determine which system is the most appropriate for projected applications. The Hughes liquid-metal cathode plasma valve (LMPV) played a major role in this investigation because it is, at present, the only device capable of carrying high average currents with attendant recovery rates comparable to vacuum devices. The program was divided into three tasks. These tasks were: (1) Using the LMPV, evaluate experimentally different interruption methods; (2) through a scaling study provide a preliminary design of an 8.5-kA average, 10-kA peak, 100-kV LMPV; and (3) perform a systems study. GRA

N74-21876# Martin Marietta Aerospace, Denver, Colo.
C-BAND CYLINDRICAL ARRAY Final Report, 17 Jul. 1973 - 31 Jan. 1974
D. Bottoms, A. Hargis, E. Kirchhoff, and D. Lynes Jan. 1974 100 p refs
(Contract N00014-74-C-0022)
(AD-774883; MCR-74-1002) Avail: NTIS CSCL 09/5

The report details the design and fabrication of a C-band (6.4-8.9 GHz) cylindrical array with 360 degree azimuth coverage and an elevation beam squinted out of the azimuth plane. The array was designed using computer program calculations to determine such parameters as allowable element spacing, allowable squint angle (without grating lobes) and element positional tolerance. The element phase and amplitude excitation errors which were acceptable were also determined by the computer program. The array arrangement selected was eight rows of eight elements staggered and stacked in a cylindrical configuration. The element type selected was a fat dipole over a cup reflector which exhibited a 42% bandwidth. The feed network was a series of microcircuit power dividers arranged with one input and 64 outputs which exhibited an octave bandwidth. (Modified author abstract) GRA

N74-21877# Army Electronics Command, Fort Monmouth, N.J.
FAILURE ANALYSIS OF AUTODIN MICROELECTRONICS
E. B. Hakim and R. Holevinski Jan. 1974 21 p refs
(DA Proj. 1S7-62705-A-056)
(AD-774796; ECOM-4187) Avail: NTIS CSCL 09/5

A total of 401 integrated circuits (IC), both monolithic and hybrid, were investigated. These devices were obtained from AUTODIN systems, which were being repaired at the Tobyhanna Army Depot, Tobyhanna, Pa. Results are discussed. GRA

N74-21878# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
BROADBAND TRANSMITTER TUBE Triannual Report, 1 Jul. - 30 Oct. 1973
A. E. Manoly Jan. 1974 26 p
(Contract DAAB07-72-C-0294; DA Proj. 1S0-62102-A-042)
(AD-774822; EDD-W-5262-4; ECOM-0294-4; Rept-4) Avail: NTIS CSCL 09/1

Cold test data was taken for the Ku-Band figure 8 circuit structure. Impedance, phase velocity and dielectric loading factor were measured. Dual beam electron gun design studies were performed. An electrolytic tank was used to determine the initial gun design. Electron trajectories along with beam characteristics were evaluated using a digital computer program. Author (GRA)

N74-21879# Michigan Univ., Ann Arbor.
ANTENNA ARRAYS: DESIGN AND THEORY FOR RADIO PULSAR TIMING MEASUREMENTS Final Report, 1 Mar. 1971 - 31 Aug. 1973
Jess Scott 15 Feb. 1974 39 p refs
(Contract N00014-67-A-0181-0037; NR Proj. 004-990)
(AD-775252; UM/RAO-1974-1) Avail: NTIS CSCL 09/1

A study was made of published radio data on 57 pulsars to determine specifications for an antenna and receiver system for the precise timing of pulsar pulses. The study attempted to optimize the frequency choice, the receiver system, and array size for a given choice of pulsars and timing error. An approximate theory was developed to relate antenna area and pulsar parameters to the timing error. The theory was tested against the pulsar data. Then an array was specified which would give a timing error of less than 100 microsec on 15 pulsars. These results could be used in a feasibility study of a portable navigation system dependent only upon natural extraterrestrial radio signals. Author (GRA)

N74-21880# Ohio State Univ., Columbus. ElectroScience Lab.
A NUMERICAL METHOD FOR ANTENNAS RECESSED IN A CAVITY OR A WAVEGUIDE WHICH OPENS INTO A HALF-SPACE
E. H. Newman Jan. 1974 52 p refs
(Contract N00014-67-A-0232-0018)
(AD-775251; ESL-3468-3) Avail: NTIS CSCL 09/5

The problem considered is that of a perfectly conducting obstacle or probe in a waveguide or a cavity which opens into a half-space. A modal solution to the problem is described in terms of open waveguide modes. The open waveguide modes are defined, a method for evaluating them presented, and finally they are used in the solution of the above mentioned problem. Numerical data is presented for the case of an air filled and a dielectric loaded parallel plate cavity which opens into a half-space. While the current on the probe is assumed to be known for the numerical calculations, equations are given which could be solved for the probe current. Numerical difficulties were encountered in attempting to calculate the open waveguide modes for a rectangular waveguide. Author (GRA)

N74-21881# Raytheon Co., Wayland, Mass. Equipment Development Labs.
MULTIPLE TARGET STEERABLE TELEMETRY TRACER SYSTEM (MUSTRAC) Final Report
Jan. 1974 117 p
(Contract N00019-71-C-0487)
(AD-775240) Avail: NTIS CSCL 09/6

The report documents the successful design, fabrication and test of an Advanced Development Model of a Multiple Target Steerable Telemetry Tracker System (MUSTRAC). The MUSTRAC System has the capability of acquiring, tracking, and recording data from four independently maneuvering telemetry sources over a 50-degree solid angle. The report describes the MUSTRAC

system which forms multiple simultaneous beams completely filling the required 50-degree solid angle and which, under control of a small computer, tracks four sources by a combination of switching and combining of these beams. GRA

N74-21882# Intelcom Rad Tech, San Diego, Calif.
STUDY OF THE EFFECTS OF RADIATION ON THE ELECTRICAL AND OPTICAL PROPERTIES OF Hg Cd Te
Joseph F. Colwell, B. A. Green, Roland Leadon, Charles E. Mallon, and James A. Naber 3 Dec. 1973 62 p refs
(Contract F19628-72-C-0311; AF Proj. 5621)
(AD-775389; RT-8027-004; AFCRL-TR-73-0761) Avail: NTIS CSCL 20/12

The report describes the results of experimental and theoretical investigation of the effects of electron irradiation on the electrical and optical properties of the alloy semiconductor HgCdTe. These results include measurements of the carrier concentration, Hall mobility, carrier lifetime, and photoconductive response for the preirradiation conditions, as a function of electron fluence and as a function of annealing temperature. The electron irradiations of these samples were performed at 80K with 5-MeV electrons and at annealing temperatures up to 350K. A model is developed to explain the changes in mobility, carrier concentration, and photoconductive response. GRA

N74-21883# Control Data Corp., Minneapolis, Minn. Aerospace Div.
PLASMA DISPLAY/KEYBOARD ADVANCED DEVELOPMENT MODEL Final Report, 1 Jul. 1972 - 1 Jul. 1973
R. Kolodnyckij, R. D. Willey, C. Bergman, R. A. Strom, and H. T. Nielsen Oct. 1973 101 p refs
(Contract DAAB07-72-C-0321)
(AD-775397; ECOM-0321-F) Avail: NTIS CSCL 09/5

The report discusses the electrical and the mechanical characteristics of the Advanced Development Model of the Display/Keyboard Model (Feasibility Type). In particular, it describes the plasma display panel, the keyboard, the logic, and the mechanical configurations and characteristics. Author (GRA)

N74-21884# Hughes Aircraft Co., Carlsbad, Calif. Industrial Products Div.
STORAGE CAMERA TUBE WITH NON-DESTRUCTIVE READOUT Quarterly Progress Report, 1 Jul. - 30 Sep. 1973
L. S. Yaggy Jan. 1974 20 p
(Contract DAAB07-73-C-0330; DA Proj. 1S7-62705-A-055)
(AD-774830; ECOM-0330-1; QPR-1) Avail: NTIS CSCL 09/1

The report describes the progress to develop a novel camera-tube capable of dual-mode operation, either as a real-time television camera-tube or as a storage camera tube with non-destructive readout, switchable upon command. Investigations of the target and electron gun for the storage camera-tube are in progress. The geometry of the initial targets proved to be suitable for dual-mode operation. The overall tube configuration is relatively firm, and parts drawings were completed. Calculations predict adequate sensitivity at 1.06 micrometers wavelength with a target-thickness consistent with resolution requirements. (Modified author abstract) GRA

N74-21885# Electrac, Inc., Anaheim, Calif.
PHASE LOCK TRACK RECEIVER
Raymond W. Honey, Sih Y. Cheng, and Warren L. Christianson 15 Jan. 1974 9 p
(Contract N00014-73-C-0123)
(AD-774937; TR-3) Avail: NTIS CSCL 09/5

All of the circuit cards were completed during the reporting period. All circuit cards were tested and installed. Subsystem tests revealed a number of problems, primarily concerned with the timing references used. GRA

N74-21886# Calspan Corp., Buffalo, N.Y.
MICROWAVE POWER GENERATION ANALYSIS Final Technical Report, Jul. - Dec. 1973
Lawrence R. Burdette Dec. 1973 94 p refs
(Contract DAAK02-73-C-0504; DA Proj. 1W7-62712-AJ-21)
(AD-774818; CALSPAN-MK-5359-E-1) Avail: NTIS CSCL 09/5

An analysis of existing and future capability in high-power CW microwave generation was performed. Existing high-power tubes include 500 kW klystrons in E-band and H-band, and a 400 kW Amplitron in E-band. Future tube development programs could produce tubes with 10 MW output in D-band (1 GHz) and with 1 MW output in I-band (10 GHz). Cost, size, weight, and probability of achieving rated output power data have been developed for presently feasible 1-MW generators, and for generators using developmental devices. A prototype 1-MW E-band generator could be developed within 2 years at a cost of approximately $1.3M, would occupy one 40 foot, fifth-wheel, trailer, would weigh 57,000 lbs, and would have a 0.85 probability of achieving 1-MW power output. Author (GRA)

N74-21887# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
DIGITAL SIGNAL PROCESSING Semiannual Technical Report, 15 Jul. 1973 - 15 Jan. 1974
Alan V. Oppenheim 26 Feb. 1974 14 p
(Contract N00014-67-A-0204-0064)
(AD-775559; SATR-15) Avail: NTIS CSCL 09/4

The following studies are discussed in the report: Development of a high speed digital processor for speech synthesis; design of two-dimensional recursive digital filters; reconstruction of multi-dimensional signals from their projections; signal analysis by cepstral prediction; speed transformations of speech; and the hardware implementation of a non-recursive digital filter. (Modified author abstract) GRA

N74-21888# Collins Radio Co., Cedar Rapids, Iowa.
HIGH STABILITY TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR STUDY Interim Report, 30 Apr. - 30 Oct. 1973
Gayle E. Buroker Feb. 1974 23 p ref
(Contract DAAB07-73-C-0137; DA Proj. 1S7-62705-AH-94)
(AD-774821; ECOM-0137-1; IR-1) Avail: NTIS CSCL 09/5

The feasibility of a 5 pp 10 to the 8th power, high stability temperature compensated crystal oscillator (HSTCXO) was shown previously on USAEC contract no. DAAB07-71-C-0136. The objective of this study is to maintain or improve the previous performance characteristics while reducing package size from 6.5 to 2.0 cubic inches. Studies pertinent to the practicality of volume production and use in tactical equipments are to be conducted, including thermally induced hysteresis, thermal transient behavior, frequency aging, and methods of reducing compensation cost. Study results to date indicate the size reduction is feasible mechanically. Certain degrees of thermal compromise are necessary as size shrinks, however, and the level of electrical/thermal performance will not be known until models are constructed and tested during the next period. Aging performance of a few HSTCXO models constructed on the previous contract appears to be less than 5 pp 10 to the 10th power. Author (GRA)

N74-21889# Office of Naval Research, London (England).
CONFERENCE ON HYBRID MICROELECTRONICS Conference Report
P. H. Enslow and Arthur H. Waynick 27 Nov. 1973 17 p
(AD-775226; ONRL-C-25-73) Avail: NTIS CSCL 09/5

A state of the art survey of thick film and thin film hybrid circuits, combinations of descrete and deposited components, was the subject matter of the conference covered in the report. All facets of the technology are dealt with and specifically related to other forms of electronic assemblies. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-21890 Schneider Electronique, Rungis (France). Lab. d'Instrumentation.
STUDY AND DEVELOPMENT OF A 0.0001 CLASS DIGITAL TO ANALOG CONVERTER: APPLICATIONS TO A RANGE OF INSTRUMENTS Final Report [RECHERCHE ET

REALISATION D'UN CONVERTISSEUR ANALOGIQUE NUMERIQUE DE CLASSE 0.0001 UTILISANT LA TECHNOLOGIE MOS. APPLICATIONS DANS UNE GAMME D'APPAREILS COMPTE RENDU DE FIN DE CONTRAT]
Paul Fermin Dec. 1972 36 p In FRENCH
(Contract DGRST-71-7-2826)
Avail: Issuing Activity

The characteristics and production development methodology for a LIS digital to analog converter of the 0.001 class using MOS technology are presented. The logic design is detailed using a 20 bit series word in code 1244' together with the time sequence of total duration 20 ms. Reliability problems are discussed in view of a MTBF of 5000 hrs, and precision is analyzed with regard to the various instrument error sources. Prototype tests are detailed with regard to methodology, automaticity, and quality control. ESRO

N74-21891*# National Aeronautics and Space Administration, Washington, D.C.
SWITCHING THEORY OF LINEAR MICROWAVE NETWORKS
Hans Brand Jan. 1973 39 p Transl. into ENGLISH from Schaltungslehre linearer Mikrowellennetze, 1970 p 136-143, 205-211, 226-231, 285-289
(NASA-TT-F-14736) Avail: NTIS HC $5.00 CSCL 09C

Linear 1-port sources with sinusoidal (time-wise) source variables, i.e., single-frequency source variables whose frequencies lie within the domain of definition of the 1-port network are discussed. If this source is now connected with a linear, time-independent and sourceless 1-port network or an equivalent network, all variables of state for the entire system are sinusoidal and of the same frequency as the source variable, and can thus be represented by vectorial or scalar components. The operating state of the source is now described by a suitable pair of state variables in the reference plane, in the same manner as for the sourceless 1-port network. The same conventions are assumed to apply to the coordinate system and the reference structure as for the corresponding 1-port network; in particular, the z-direction is taken to be positive going into the junction in both cases. Author

N74-21892# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
APLAC2: A FLEXIBLE dc AND TIME DOMAIN CIRCUIT ANALYSIS PROGRAM FOR SMALL COMPUTERS
Martti Valtonen 1973 76 p refs
(S-56) Avail: NTIS HC $7.00

APLAC2 (Analysis Program for Linear Active Circuits) is a small nodal analysis program written in BASIC for the dc and time domain analysis of linear (and nonlinear) networks. The basic elements accepted by APLAC2 are the lumped linear (time-invariant or time-variable) resistances, inductances, and capacitances as well as independent and the two types of controlled current sources. The output consists of the node voltages. Because of the flexibility of BASIC, APLAC2 is capable of performing the analysis of nonlinear and lossless transmission line networks and dc-sensitivity, dc-worst-case and Monte-Carlo analyses. Furthermore, mutual couplings, arbitrary library models, and resistive n-ports may be used with the networks to be computed. Author (ESRO)

N74-21893# Illinois Univ., Urbana. Coordinated Science Lab.
A COMPARISON OF THE GAUSSIAN ELIMINATION METHOD AND AN OPTIMIZATION TECHNIQUE USING THE ADJOINT NETWORK FOR THE ANALYSIS OF LINEAR CIRCUITS M.S. Thesis
Walter Alan Schuppan Sep. 1973 44 p refs
(Contract DAAB07-72-C-0259; Grant NSF GK-31633)
(AD-774374; R-623; UILU-ENG-73-2225) Avail: NTIS CSCL 09/5

One of the most important tools in circuit analysis is an efficient routine that obtains the solution to a set of simultaneous linear algebraic equations. This routine is common to dc analysis, ac analysis, transient analysis, and nonlinear analysis programs and is usually the most time consuming operation. Much effort has been directed into the development of such routines and many are in existence. They are often broken down into three categories. The direct methods include Gaussian elimination and matrix inversion. These methods are usually more reliable and, thus, preferred over the others. The Gauss-Seidel method is typical of a second category called the stationary iterative methods. A third category contains the iterative techniques based upon the minimization of an error function of quadratic form. A member of this third category is the subject of investigation in this paper. GRA

N74-21894# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
ELECTROMAGNETIC INTERFERENCE TESTS FOR ELECTRONIC EQUIPMENT Final Report
1 Feb. 1974 22 p refs
(AMCR Proj. 310-6)
(AD-775446; TOP-6-2-542) Avail: NTIS CSCL 09/3

The report prescribes procedures and techniques for measuring frequencies and amplitudes of the electromagnetic interference characteristics (emission, compatibility, and susceptibility) of electronic and electromechanical equipment, systems and subsystems. It discusses selection of a testing chamber, sources of error due to chamber wall reflections, and techniques for error reduction. Definitions of terminology are provided. It is not applicable to vehicles and electrical subsystems or noncommunications electronic equipment. (Modified author abstract) GRA

N74-21895# Naval Postgraduate School, Monterey, Calif.
CORRELATION FUNCTION USING LAGUERRE TYPE CIRCUITS M.S. Thesis
Jorge Pedro Auge Dec. 1973 63 p refs
(AD-775024) Avail: NTIS CSCL 09/5

The work deals with the correlation functions and their methods of obtention. A method without a pure time delay is considered which uses Laguerre functions type filters. The possibilities of using the nonsymmetric Laguerre type filter are analyzed. A very inexpensive set of circuits which are useful to obtain the mentioned filters for low frequency signals are presented, together with their computer analysis and laboratory realizations. Author (GRA)

N74-22121 Saab-Scania, Linkoping (Sweden).
SYSTEMS ANALYSIS AND PERFORMANCE EVALUATION
B. Schmidtbauer *In its* Satellite Attitude Control and Stabilisation Using On-board Computers Jul. 1973 p 167-392 refs (For availability see N74-22119 13-14)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-21896*# Biospherics, Inc., Rockville, Md.
AUTOMATED MICROBIAL METABOLISM LABORATORY Quarterly Progress Report, 1 Oct. - 31 Dec. 1973
28 Feb. 1974 67 p ref
(Contract NASw-2280)
(NASA-CR-138146) Avail: NTIS HC $6.50 CSCL 14B

The design and rationale of an advanced labeled release experiment based on single addition of soil and multiple sequential additions of media into each of four test chambers are outlined. The feasibility for multiple addition tests was established and various details of the methodology were studied. The four chamber battery of tests include: (1) determination of the effect of various atmospheric gases and selection of that gas which produces an optimum response; (2) determination of the effect of incubation temperature and selection of the optimum temperature for performing Martian biochemical tests; (3) sterile soil is dosed with a battery of C-14 labeled substrates and subjected to experimental temperature range; and (4) determination of the possible inhibitory effects of water on Martian organisms is performed initially by dosing with 0.01 ml and 0.5 ml of

medium, respectively. A series of specifically labeled substrates are then added to obtain patterns in metabolic 14CO2 (C-14)O2 evolution. Author

N74-21897*# Kanner (Leo) Associates, Redwood City, Calif.
TEST STANDS FOR STUDYING TECHNOLOGICAL PROCESSES UNDER SIMULATED SPACE CONDITIONS
B. Ye. Paton, D. A. Dupko, V. N. Bernardskyi, V. F. Lapchinskiy, V. V. Stesin, A. A. Zagrebelinyy, and O. S. Sygankov Washington NASA Apr. 1974 12 p Transl. into ENGLISH from 24th Intern. Astronautical Congr. (Baku), 7-13 Oct. 1973 p 12
(Contract NASw-2481)
(NASA-TT-F-15538; A74-12844) Avail: NTIS HC $4.00 CSCL 14B

A review was made of equipment designed for use in experiments with technological operations on board spacecraft during Soviet manned space missions. Experiments with molten metal on Soyuz 6 in October 1969 are indicated as an example of such operations. Particular attention is given to the difficulties encountered in simulation of the various adverse forces and factors which must be dealt with and counteracted during the performance of industrial work in a space environment. Investigations showed that the best space vacuum simulation could be achieved in large vacuum chambers whose dimensions match those of the equipment to be simulated and tested. Several test stands developed in the Soviet Union for this purpose are described. Author

N74-21898*# General Electric Co., Philadelphia, Pa.
A FORWARD SPEED EFFECTS STUDY ON JET NOISE FROM SEVERAL SUPPRESSOR NOZZLES IN THE NASA/AMES 40- BY 80-FOOT WIND TUNNEL Final Report
M. R. Beulke, W. S. Clapper, E. O. McCann, and H. M. Morozumi 3 May 1974 264 p refs
(Contract NAS2-7457)
(NASA-CR-114741) Avail: NTIS HC $16.25 CSCL 14B

A test program was conducted in a 40 by 80 foot wind tunnel to evaluate the effect of relative velocity on the jet noise signature of a conical ejector, auxiliary inlet ejector, 32 spokes and 104 tube nozzle with and without an acoustically treated shroud. The freestream velocities in the wind tunnel were varied from 0 to 103.6 m/sec (300 ft/sec) for exhaust jet velocities of 259.1 m/sec (850 ft/sec) to 609.6 m/sec (2000 ft/sec). Reverberation corrections for the wind tunnel were developed and the procedure is explained. In conjunction with wind tunnel testing the nozzles were also evaluated on an outdoor test stand. The wind tunnel microphone arrays were duplicated during the outdoor testing. The data were then extrapolated for comparisons with data measured using a microphone array placed on a 30.5 meter (100 ft) arc. Using these data as a basis, farfield to nearfield arguments are presented with regards to the data measured in the wind tunnel. Finally, comparisons are presented between predictions made using existing methods and the measured data. Author

N74-21899# Advisory Group for Aerospace Research and Development, Paris (France).
A REVIEW OF CURRENT RESEARCH AIMED AT THE DESIGN AND OPERATION OF LARGE WINDTUNNELS
Mar. 1974 55 p refs
(AGARD-AR-68) Avail: NTIS HC $5.75

The proceedings of a conference on wind tunnel design are presented. The subjects discussed are: (1) wind tunnel design and operation, (2) testing techniques, (3) special techniques for engine simulation, (4) techniques for high lift and V/STOL testing, (5) problems of testing at transonic speeds, and (6) fluid motion problems. Author

N74-21900*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TESTING A SATELLITE AUTOMATIC NUTATION CONTROL SYSTEM
John A. Hrasiar Washington NASA May 1974 19 p
(NASA-TN-D-7596, G-7426) Avail: NTIS HC $3.00 CSCL 14B

Testing of a particular nutation control system for the synchronous meteorological satellite (SMS) is described. The test method and principles are applicable to nutation angle control for other satellites with similar requirements. During its ascent to synchronous orbit, a spacecraft like the SMS spins about its minimum-moment-of-inertia axis. An uncontrolled spacecraft in this state is unstable because torques due to fuel motion increase the nutation angle. However, the SMS is equipped with an automatic nutation control (ANC) system which will keep the nutation angle close to zero. Because correct operation of this system is critical to mission success, it was tested on an air-bearing table. The ANC system was mounted on the three-axis air-bearing table which was scaled to the SMS and equipped with appropriate sensors and thrusters. The table was spun up in an altitude chamber and nutation induced so that table motion simulated spacecraft motion. The ANC system was used to reduce the nutation angle. This dynamic test of the ANC system met all its objectives and provided confidence that the ANC system will control the SMS nutation angle. Author

N74-21901# Battelle-Northwest, Richland, Wash.
EVALUATION OF A HIGH VOLUME CASCADE PARTICLE IMPACTOR SYSTEM
G. A. Sehmel Sep. 1973 14 p refs Presented at Am. Chem. Soc. 2d Joint Conf. on Sensing of Environ. Pollutants, Washington, D. C., 10 Dec. 1973
(Contract AT(45-1)-1830)
(BNWL-SA-4677; Conf-731205-2) Avail: NTIS HC $3.00

Commercially available 20 cfm cascade impactors were evaluated under field sampling conditions for particle sampling bias caused by interstage losses and by non-wind direction sampler orientation. An integrated sampler using an impactor and a wind direction self-orienting cowl attachment decreased particle sampling bias. Author (NSA)

N74-21902# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
HOOK BOUNCE TEST OF THE C-2A AIRPLANE ARRESTING GEAR A FRAME Final Report
R. B. Cadman 1 May 1973 15 p refs Revised
(AD-774085; NADC-72217-VT-Rev-A) Avail: NTIS CSCL 01/2

A laboratory hook bounce test was performed on a C-2A arresting gear A frame to determine whether the A frame could sustain the effects of 3000 arrested landings. A total of 6000 simulated hook bounce cycles were applied to the A frame during the test with no structural failures. With a test scatter factor of two, the 6000 test cycles are equivalent to 3000 service arrested landings. Author (GRA)

N74-21903# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
HOOK BOUNCE TEST OF THE E-2A AIRPLANE ARRESTING GEAR A FRAME Final Report
Robert B. Cadman 15 Dec. 1973 16 p refs Revised
(AD-774086; NADC-72218-VT-Rev-A) Avail: NTIS CSCL 01/5

A laboratory hook bounce test was performed on an E-2A arresting gear A frame to determine whether the A frame could sustain the effects of 3,000 arrested landings. A total of 6,000 simulated hook bounce cycles were applied to the A frame during the test with no structural failures. With a test scatter factor of 2, the 6,000 test cycles are equivalent to 3,000 service arrested landings. Author (GRA)

N74-21904# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTICS AT MINOT AIR FORCE BASE, NORTH DAKOTA Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Jan. 1974 35 p (AF Proj. 683M)
(AD-773403; AFWL-TR-73-241) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory (AFWL) standard skid-resistance test conducted at Minot AFB, North Dakota, on 18 and 19 October 1972, are analyzed. The test results indicate the runway surface had good to fair skid-resistance properties and no corrective action was indicated at the time of the test. Author (GRA)

N74-21905# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

ENGINEER DESIGN TESTS OF MODIFIED DUST-CONTROL MATERIALS AND PROTOTYPE EQUIPMENT Final Report
Moody M. Culpepper and Richard Osmond Dec. 1973 129 p refs
(DA Proj. 1G6-64717-DH-01)
(AD-772961; AEWES-Misc-Paper-S-73-67) Avail: NTIS CSCL 13/2

Engineer design tests were performed on a dust-control system, i.e. materials and prototype emplacement equipment. The performance of the dust-control material exceeded the criteria of the currently existent Qualitative Materiel Requirement. The liquid distributor for dust control described herein performed well on-road, off-road, and during spraying operations. Design changes will be required in order to meet the vehicle weight requirement and to improve the maintainability of the vehicle. Based on the results of the tests reported herein, it is concluded that the dust-control system is suitable for engineering tests/expanded service tests. (Modified author abstract) GRA

N74-21906# Naval Undersea Center, San Diego, Calif.
RECOMMENDED PRACTICES FOR THE DESIGN, FABRICATION, PROOFTESTING AND INSPECTION OF WINDOWS IN MAN-RATED HYPERBARIC CHAMBERS Independent Exploratory Development Report, Jan. 1972 - Jun. 1973
Jerry D. Stachiw Dec. 1973 58 p refs
(AD-773737; NUC-TP-378) Avail: NTIS CSCL 06/11

A concise recommendation is given for the design, fabrication, proof-testing and inspection in-service of acrylic plastic windows for manned hyperbaric chambers (this includes PTC's, DDC's, one atmosphere habitats, high altitude simulation chambers, recompression chambers, et cetera). The recommendation is limited to a temperature range of -60F to +150F and maximum pressure of +3500 psi. The standard window shapes discussed are flat disc, conical frustum and spherical shell sector. Detailed recommendation is also given for qualification and lot acceptance tests that the acrylic plastic material must pass in order to be accepted as fabrication stock for windows in manned hyperbaric chambers. Author (GRA)

N74-21907# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTICS AT ROYAL AIR FORCE UPPER HEYFORD, ENGLAND Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Jan. 1974 33 p
(AF Proj. 683M)
(AD-773404; AFWL-TR-73-237) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory (AFWL) standard skid-resistance test conducted at Royal Air Force Upper Heyford, England, on 22 November 1972, are analyzed. Test results indicate the runway surface had good skid-resistance properties and no corrective action was indicated at the time of the test. Author (GRA)

N74-21908# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTICS AT MACDILL AIR FORCE BASE, FLORIDA Final Report, 15 Jun. - 15 Aug. 1973
Phil V. Compton Jan. 1974 43 p
(AF Proj. 683M)
(AD-773406; AFWL-TR-73-240) Avail: NTIS CSCL 01/5

Data gathered during a joint Air Force Civil Engineering Center (AFCEC) and Air Force Weapons Laboratory (AFWL) standard skid-resistance test conducted at MacDill AFB, Florida, on 30 June 1973 are analyzed. The test results indicate the runway surface had good skid-resistance properties. Rubber removal in the primary runway touchdown area should be programmed. The secondary runway touchdown area has a moderate rubber buildup and could, depending on traffic volume, reach a condition where the rubber needs to be removed. Author (GRA)

N74-21909# Missouri State Highway Dept. Div. of Materials and Research.
AN INVESTIGATION OF SKID RESISTANCE IN MISSOURI. STUDY 69-3 Final Report
Aug. 1973 115 p refs
(PB-226667/4GA; MCHRP-73-3) Avail: NTIS HC $4.25 CSCL 13B

A comprehensive investigation in Missouri is reported of skid resistance using a two wheel skid trailer measuring both slip and skid resistance. An attempt was made to standardize test results for the many environmental effects present. Surfaces containing various fine and coarse aggregates were studied. Comparisons were made between the occurrence of wet pavement accidents and pavement skid resistance. Procedures for texturing Portland cement concrete pavements were investigated, in addition to changes in asphaltic concrete mix designs and use of special aggregate materials. GRA

N74-21910# Air Force Weapons Lab., Kirtland AFB, N.Mex.
C-130 LANDING ON XM-18B LANDING MAT, OAK GROVE AUXILIARY AIR FIELD, NORTH CAROLINA Final Report, Feb. - May 1973
H. R. Marien Feb. 1974 70 p refs
(AF Proj. 683M)
(AD-775365; AFWL-TR-73-254) Avail: NTIS CSCL 01/5

During March and April 1973, a large number of C-130 aircraft operations were conducted on an XM-18B landing-mat runway at Oak Grove Auxiliary Air Field, North Carolina. Detailed measurements were made to determine the lateral and longitudinal movement of the mat at the conclusion of each day's operations. The methods used to make these measurements, the data collected, an analysis of the data and recommendations for future efforts to measure landing-mat movement are presented. Although there were no landing-mat failures at Oak Grove AAF, the 60-by-3500-foot runway did move as much as 13 inches. Transverse bowing, vertical movement, and random lateral shifting were observed and documented. Author (GRA)

N74-21911# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SMALL APERTURE TESTING FOR AIRFIELD PAVEMENT EVALUATION Final Report
Jim W. Hall, Jr. and Darrell R. Elsea Feb. 1974 36 p refs
(DA Proj. 4DM-78012-AQ-61)
(AD-775406; AEWES-Misc-Paper-S-74-3) Avail: NTIS CSCL 01/5

The high intensity of aircraft operations on most military airfields prohibits the closing of runways and other pavement facilities in order to measure the physical properties of the pavement necessary to evaluate its load-carrying capability. Also, the introduction of multiple-wheel heavy gear load aircraft coupled with an ever increasing number of aircraft operations has emphasized the need to know the load-carrying capability of pavement structures and to anticipate future pavement performance. The objective of this study was to develop techniques for determination of the required pavement properties that can be used with a minimum of pavement destruction and interference with aircraft operations. GRA

N74-21912# Decision Systems Associates, Inc., Rockville, Md.
UNITED STATES AIR FORCE TRAINING LINE SIMULATOR Final Report
Franz Nauta and Michael B. Pierce Dec. 1973 52 p refs
(Contract F41609-70-C-0047; AF Proj. 6323)
(AD-774572; AFHRL-TR-73-61) Avail: NTIS CSCL 05/9

The report describes the technical aspects and potential applications of a computer-based model simulating the flow of airmen through basic training and entry-level technical training. This report gives an extensive description of input control cards and files necessary for an application of the Airman Training Line Simulator Model. The objective of this Training Line Simulator is to assess the impacts of alternative recruit classification and training policies under a wide variety of assumptions regarding the quality of recruits and entry-level training parameters. Parameters accommodated by the model include mandatory course prerequisities, attrition and setback rates, class schedules and quotas, and a host of individual airman attributes. The model evaluates the impacts of training parameter changes by determining the maximum percent fills of training quotas, the size of the waiting lines for technical training courses, student-instructor ratios and the numbers of setbacks, attritions and unassigned basic training graduates. The Training Line Simulator is an entity simulation model with imbedded optimizations to achieve optimal fill of training quotas. The model employs an asynchronous as opposed to incremental projection methodology

to achieve execution efficiencies. (Modified author abstract) GRA

N74-21913# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
EXPEDIENT SNOW AIRSTRIP CONSTRUCTION TECHNIQUE
E. F. Clark, G. Abele, and A. F. Wuori Dec. 1973 20 p refs
(DA Proj. 4A0-62103-A-894)
(AD-774290; CRREL-SR-198) Avail: NTIS CSCL 01/5

Specialized snow runway processing and construction equipment ordinarily is not available to Army engineer troop units. Therefore, utilization of existing equipment and devices improvised in the field is necessary. Disaggregation of the natural snow cover, followed immediately by compaction and grading, is the fundamental procedure required for preparing a snow pavement capable of supporting, after age hardening, wheeled aircraft of the Caribou and C-47 class. A peg-toothed A-frame harrow, a corrugated roller and drags, constructed in the field, can be used with available D-7 or D-8 bulldozers for the disaggregation, compaction, and grading processes.
Author (GRA)

N74-21914# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT WURTSMITH AFB, MICHIGAN Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Jan. 1974 41 p refs
(AF Proj. 683M)
(AD-774615; AFWL-TR-73-258) Avail: NTIS CSCL 01E

Data gathered during the Air Force Weapons Laboratory (AFWL) standard skid-resistance test conducted at Wurtsmith AFB, Michigan, on 10 October 1972 are analyzed. The test results indicate the runway surface had only fair skid-resistance properties and warrants retesting within 12 to 18 months to ensure the skid-resistance properties have not deteriorated further. When it is necessary to program improvements to the Wurtsmith AFB runway, a 2-inch asphaltic concrete overlay is recommended to eliminate chert pop outs. Author (GRA)

N74-21915# Naval Civil Engineering Lab., Port Hueneme, Calif.
ICE ENGINEERING: VISCOELASTIC FINITE ELEMENT FORMULATION Technical Report, Sep. 1972 - May 1973
Michael G. Katona Jan. 1974 61 p refs
(YF53536)
(AD-774482; NCEL-TR-803) Avail: NTIS CSCL 08/12

The most efficient design, construction, and use of polar-ice-shelf facilities for operation and parking of aircraft, cargo storage, and other purposes depends on a thorough and correct engineering analysis of the structural integrity of the sea-ice layer. The viscoelastic finite element analysis technique and computer program developed in this investigation have proven to be an accurate versatile, and powerful tool for solving a wide class of boundary value problems including (1) arbitrary axisymmetric and plane strain geometries subjected to quasi-static, symmetric loading, and (2) layered half-space systems resting on a fluid foundation with arbitrary surface loading, such as sea-ice sheets subjected to aircraft loading. The viscoelastic model includes independent bulk and shear relaxation functions characterized by exponential series. (Modified author abstract) GRA

N74-21916# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT KINCHELOE AFB, MICHIGAN Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Jan. 1974 40 p
(AF Proj. 683M)
(AD-774054; AFWL-TR-73-281) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory (AFWL) standard skid-resistance test conducted at Kincheloe AFB, Michigan, on 12 October 1972 are analyzed. The test results indicate the skid-resistance properties of the pavement surface at Kincheloe AFB could be rated only fair. The pavement surface was considered borderline and hydroplaning could occur, depending on circumstances encountered. Rubber removal was required on the 33 end of the runway at the time of the test.
Author (GRA)

N74-21917# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT GRAND FORKS AFB, NORTH DAKOTA Final Report, 1 Nov. 1972 - 30 Jun. 1973
George Ballentine and Phil V. Compton Jan. 1974 42 p
(AF Proj. 683M)
(AD-774056; AFWL-TR-73-250) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory standard skid-resistance test conducted at Grand Forks AFB, ND, on 17 October 1972 are analyzed. The test results indicate the runway surface had fair skid-resistance properties at the time of the test. Rubber removal was required at both the 17 and 35 ends of the runway. Author (GRA)

N74-21918# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT ROYAL AIR FORCE LAKENHEATH, ENGLAND Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Jan. 1974 37 p refs
(AF Proj. 683M)
(AD-774057; AFWL-TR-73-246) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory's standard skid-resistance test conducted at Royal Air Force Lakenheath, England, on 28 November 1972 are analyzed. Test results indicate the porous friction surface at Royal Air Force Lakenheath had good skid-resistance properties, and no corrective action was indicated at the time of the test. Author (GRA)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-21919 Ernst-Mach-Inst., Freiburg (West Germany).
A PRELIMINARY INVESTIGATION OF THE USE OF PARTICLE TRAJECTORY ANALYSIS FOR STUDYING THE INTERACTION OF A SHOCK WAVE WITH A STRUCTURE
J. M. Dewey (Victoria Univ., British Columbia) Jan. 1973 62 p refs
(Rept-2/73) Avail: Issuing Activity

The theory of a two demensional particle trajectory analysis which could be used to study the interaction of shock waves with structures and the passage of shock waves through tunnel systems is described. The practical technique requires the introduction into the gas of discrete tracers which can be photographed using a multiple schlieren or shadowgraph system. An attempt was made to use small heated gas elements as tracers, but the passage of a shock wave produced stable vortices which continued to move through the working gas. The particle trajectories in the flow resulting from the reflection of a plane shock on a 10 deg wedge were therefore determined using a combination of heated elements and smoke stream tracers. The resulting analysis mapped the velocity, density, pressure, temperature, and vorticity fields throughout the flow. The accuracy, except for the velocity measurements, was not considered acceptable due to the accumulative effect of slight differences in the shock strengths of the forty experiments used to map flow field. Author (ESRO)

N74-21920 Ernst-Mach-Inst., Freiburg (West Germany).
REAL GAS BEHAVIOR OF AIR BEHIND PLANE STRONG SHOCK WAVES [REALGASZUSTAENDE DER LUFT HINTER EINER EBENEN STARKEN STOSSWELLE]
H. G. Prasse Oct. 1973 50 p refs In GERMAN; ENGLISH summary
(Rept-5/73) Avail: Issuing Activity

A method of calculation with which the state of gas behind strong shocks can be calculated is demonstrated. This method can also be applied to small computers. The states of hot air behind plane compression shocks were investigated in a

temperature range between 700 to 6000 K, which is equivalent to a Mach number range of between 2.6 and 15. The results are compared with ideal values and results of other authors. Results are presented in tables and diagrams. Author (ESRO)

N74-21921 Centre d'Etudes et Recherches de la Compagnie Electro-Mecanique, Le Bourget (France). Lab. de Cryotechnique.

DEVELOPMENT OF A MULTIPOLAR INDUCTOR UTILIZING THE POSSIBILITIES OF HOLLOW SUPERCONDUCTORS WITH SUPERCRITICAL HELIUM CIRCULATION Final Report [RECHERCHES EN VUE DE LA REALISATION D'UN INDUCTEUR MULTIPOLAIRE UTILISANT LES POSSIBILITES DES SUPRACONDUCTEURS CREUX A CIRCULATION D'HELIUM SUPERCRITIQUE COMPTE RENDU DE FIN DE CONTRAT]

J. P. Bordenave and A. Malandain May 1972 48 p refs In FRENCH

(Contract DGRST-70-7-2503)

Avail: Issuing Activity

A study for hermetic seals of use in alternators with rotating superconductor excitation and fixed cryostat is presented. Rotating seals using ferromagnetic liquids were investigated and discarded due to unacceptable losses. Sliding seals in graphite/ceramic were used in single seal and double seal versions and some conclusions are drawn. Rotating seals using liquid He were investigated and a test rig prepared. The possibility of having liquid helium in the rotating shaft was considered and the means used to limit the temperature at rotor tip are discussed. Problems associated with helium supercriticality are detailed. The implementation of a thermal shunt between hub and rotor tip is considered. ESRO

N74-21922*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

SCALE MODEL TESTING OF DROGUES FOR FREE DRIFTING BUOYS Final Report, Sep. 1972 - Sep. 1973

William A. Vachon Sep. 1973 143 p refs

(Contract NAS8-28916)

(NASA-CR-138122; R-769) Avail: NTIS HC $10.25 CSCL 20D

Instrumented model drogue tests were conducted in a ship model towing tank. The purpose of the tests was to observe and measure deployment and drag characteristics of such shapes as parachutes, crossed vanes, and window shades which may be employed in conjunction with free drifting buoys. Both Froude and Reynolds scaling laws were applied while scaling to full scale relative velocities of from 0 to 0.2 knots. A weighted window shade drogue is recommended because of its performance, high drag coefficient, simplicity, and low cost. Detailed theoretical performance curves are presented for parachutes, crossed vanes, and window shade drogues. Theoretical estimates of depth locking accuracy and buoy-induced dynamic loads pertinent to window shade drogues are presented as a design aid. An example of a window shade drogue design is presented. Author

N74-21923*# Boston Univ., Mass. Dept. of Aerospace Engineering.

A FINITE-ELEMENT FORMULATION FOR SUBSONIC FLOWS AROUND COMPLEX CONFIGURATIONS

Luigi Morino Dec. 1973 79 p refs

(Grant NGR-22-004-030)

(NASA-CR-138142; TR-73-05) Avail: NTIS HC $7.00 CSCL 20D

The problem of potential steady subsonic flow around complex configurations is considered. This problem requires the solution of an integral equation relating the values of the potential on the surface of the body to the values of the normal derivative, which is known from the boundary conditions. The surface of the body is divided into small (hyperboloidal quadrilateral) surface elements, which are described in terms of the Cartesian components of the four corner points. The values of the potential (and its normal derivative) within each element is assumed to be constant and equal to its value at the centroid of the element. This yields a set of linear algebraic equations. The coefficients of the equation are given by source and doublet integrals over the surface elements. Closed form evaluations of the integrals are presented. Author

N74-21924*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.

TOPICS IN STRUCTURAL DYNAMICS: NONLINEAR UNSTEADY TRANSONIC FLOWS AND MONTE CARLO METHODS IN ACOUSTICS Final Report

John Kenneth Haviland Feb. 1974 63 p refs

(Grant NGL-47-005-108)

(NASA-CR-138110; ESS-4022-113-74) Avail: NTIS HC $6.25 CSCL 20D

The results are reported of two unrelated studies. The first was an investigation of the formulation of the equations for non-uniform unsteady flows, by perturbation of an irrotational flow to obtain the linear Green's equation. The resulting integral equation was found to contain a kernel which could be expressed as the solution of the adjoint flow equation, a linear equation for small perturbations, but with non-constant coefficients determined by the steady flow conditions. It is believed that the non-uniform flow effects may prove important in transonic flutter, and that in such cases, the use of doublet type solutions of the wave equation would then prove to be erroneous. The second task covered an initial investigation into the use of the Monte Carlo method for solution of acoustical field problems. Computed results are given for a rectangular room problem, and for a problem involving a circular duct with a source located at the closed end. Author

N74-21925*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN EXPLORATORY INVESTIGATION OF A WAKE DISRUPTION TECHNIQUE FOR STUDYING WAKE REESTABLISHMENT TIME

Louis E. Clark and Robert A. Jones Washington May 1974 18 p refs

(NASA-TM-X-2961; L-9199) Avail: NTIS HC $3.00 CSCL 20D

An exploratory investigation was made of a wake disruption technique for studying the hypersonic-wake reestablishment time in a blowdown wind tunnel. In this technique, a highly underexpanded jet issuing from the base of a 10 deg half-angle cone totally disrupts and displaces the conventional wake. The jet was rapidly shut off by an explosively actuated valve and the time for wake reestablishment was measured. The tests were conducted in the Mach 6 high Reynolds number tunnel at a stagnation temperature of 506 K and stagnation pressure of 2.86 MPa. The model base jet stagnation pressure was 3.55 MPa at room temperature. High-speed schlieren motion pictures indicated that disappearance of the disrupting jet and reestablishment of the wake-recompression shock were probably occurring simultaneously and that the time disruptive-jet-air shutoff to wake recompression shock reestablishment was probably between 200 and 450 microseconds (flow lengths from 1.8 to 4.2). The values of flow lengths are about one-thord to one-half the values measured in impulse facilities in a previous study. This shorter time is believed to be largely due to difference in flow conditions between the jet disruption technique and impulse facilities. Author

N74-21926*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CALCULATION OF SUPERSONIC STREAM PARAMETERS OF A REAL GAS FROM MEASURABLE QUANTITIES USING FORTRAN 4 ROUTINES

Robert C. Johnson Washington Apr. 1974 90 p refs

(NASA-TN-D-7653; E-7643) Avail: NTIS HC $4.00 CSCL 20D

Sets of routines are presented that calculate such real-gas supersonic stream properties as velocity, density, enthalpy, entropy, and isentropic exponent. Two alternative sets of measurements are assumed: (1) stagnation pressure, stagnation temperature, and the pressure on the surface of a static-pressure wedge; or (2) pressure and temperature in a plenum upstream of a supersonic nozzle and the stagnation pressure at the exit of this nozzle. The routines are applicable to any gas whose properties are known. Explicit routines are presented for determining these properties for air, nitrogen, oxygen, normal hydrogen, parahydrogen, helium, argon, steam, methane, and natural gas. Author

N74-21927*# Scientific Translation Service, Santa Barbara, Calif.
Ph.D. Thesis - Karlsruhe Univ.
A PROCEDURE FOR THE DIRECT NUMERICAL SIMULATION OF TURBULENT FLOWS IN PLATE AND ANNULAR CHANNELS AND ITS APPLICATION IN THE DEVELOPMENT OF TURBULENCE MODELS
U. Schumann Washington NASA Apr. 1974 227 p Transl. into ENGLISH from GERMAN Ph.D. Thesis, Kernforschungszentrum Report, Karlsruhe, 1973 p 1-249
(Contract NASw-2483)
(NASA-TT-F-15391) Avail: NTIS HC $14.50 CSCL 20D

A numerical difference scheme is described to simulate three-dimensional, time-dependent, turbulent flows of incompressible fluids at high Reynolds numbers in a plate channel and in concentric annuli. The Navier-Stokes equations averaged over grid volumes are integrated. A model has been developed which takes into account strongly inhomogeneous turbulence and grid volumes of unequal side lengths. Stability criteria are established for this method and for similar difference schemes. For computation of the pressure field the appropriate Poisson's equation is solved by Fast Fourier Transform. The procedure implemented in the TRUBIT-1 program is used to simulate turbulent flows in a plate channel and an annulus radius ratio of 5:1. The numerical results are in good agreement with experimental values. Especially the velocity profile and the mean velocity fluctuations are computed with significantly better accuracy than in earlier, direct simulations. Author

N74-21928*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN EXPERIMENTAL INVESTIGATION OF WALL BOUNDARY LAYER TRANSITION REYNOLDS NUMBERS IN AN EXPANSION TUBE
K. James Weilmuenster Washington May 1974 30 p refs
(NASA-TN-D-7541; L-9337) Avail: NTIS HC $3.25 CSCL 20D

Experimental measurements of boundary-layer transition in an expansion-tube test-gas flow are presented along with radial distributions of pitot pressure. An integral method for calculating constant Reynolds number lines for an expansion-tube flow is introduced. Comparison of experimental data and constant Reynolds number calculations has shown that for given conditions, wall boundary-layer transition occurs at a constant Reynolds number in an expansion-tube flow. Operating conditions in the expansion tube were chosen so that the effects of test-gas nonequilibrium on boundary-layer transition could be studied.
Author

N74-21929*# United Aircraft Corp., East Hartford, Conn. Research Labs.
A WEAK INTERACTION STUDY OF THE VISCOUS FLOW ABOUT OSCILLATING AIRFOILS
S. J. Shamroth and J. P. Kreskovsky May 1974 167 p refs
(Contract NAS1-11568)
(NASA-CR-132425) Avail: NTIS HC $11.50 CSCL 20D

An incompressible inviscid and a viscous flow calculation procedure is developed by assuming the viscous correction to the inviscid flow pressure distribution is small (weak interaction) to predict the flow about airfoils oscillating in pitch and heave. The calculations made in the investigation predict the detailed viscous flow regions including trnsition and separation phenomena and provide a detailed analysis of leading edge separation, transition, and reattachment. Results from the calculation show the leading edge viscous flow field to be quasi-steady although the imposed inviscid pressure distribution shows significant unsteady effects. Although unable to predict the flow field about a stalled airfoil, the indications are that the present procedure can indicate the onset of catastrophic flow separation. Author

N74-21930# National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.
ON LAMINAR SEPARATION
V. V. Sychev Jan. 1974 31 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (USSR), no. 3, 1972 p 47-59
(NAL-TT-3) Avail: NTIS HC $4.75

The laminar flow of an incompressible fluid in the vicinity of the separation point on a smooth surface of solid body is investigated. It is shown that the flow separation at large Reynolds number occurs due to the action of large local positive pressure gradient, the value of which with unlimited increase of the Reynolds number R tends to infinity, as R to the 1/8 power and the region of influence of this pressure gradient tends to zero, as R to the minus 3/8 power. The limiting state of the flow in the vicinity of the point of separation when R is described by this well-known solution of the classical theory of jet flows of ideal fluid with free stream lines. Author

N74-21931# Aeronautical Research Labs., Melbourne (Australia).
A METHOD FOR CALCULATING INVISCID SEPARATED FLOW ABOUT CONICAL SLENDER BODIES
D. I. Pullin May 1973 57 p refs
(ARL/A-Rept-140) Avail: NTIS HC $6.00

The system of integro-differential equations for the shape and strength of an arbitrary number of pairs of conical vortex sheets, representing flow separation from a conical slender body, is derived within the context of slender body theory. For the case when only one pair of vortex sheets exists - that representing primary flow separation from a sharp leading edge - a numerical Newton Raphson iterative procedure for the solution of the equations is developed, based on the vortex sheet-cut-isolated vortex model of Mangler and Smith. Some calculated examples are presented for a flat plate and for circular-cone flat-plate combinations. Although no specific improvements are made over previous treatments in the prediction of the separated-flow characteristics of slender conical bodies, it is believed that the value of the present approach lies in its generality and possible extension to the calculation of flows containing a number of pairs of vortex sheets. Author

N74-21932# National Aeronautical Establishment, Ottawa (Ontario).
WALL INTERFERENCE ON TWO DIMENSIONAL SUPERCRITICAL AIRFOILS, USING WALL PRESSURE MEASUREMENTS TO DETERMINE THE POROSITY FACTORS FOR TUNNEL FLOOR AND CEILING Aeronautical Report
M. Mokry, P. J. Peake, and A. J. Bowker Feb. 1974 44 p refs
(NRC-13894; LR-575) Avail: NTIS HC $5.25

The effects of unequal porosity factors, ascribed to the floor and ceiling of two-dimensional wind tunnel test sections, are investigated with a simplified mathematical model that utilizes a point vortex and a point doublet placed mid-way between the two walls. Closed form solutions are derived, using the method of images, for wall pressure distributions, and corrections to Mach number and model angle of attack. The predicted wall pressure distributions are compared with experimental results obtained in a 15 x 60 inch high Reynolds number two-dimensional test facility for three airfoils with thickness-chord ratios from 0.10 to 0.17 and chords of 10 and 15 inches. Agreement is shown to be markedly better than is possible with equal porosity factors. Reasonable agreement continues up to tunnel mainstream Mach numbers of about 0.82, providing confidence in the derived blockage and angle of attack corrections. Author

N74-21933# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
ANALYSIS OF CYLINDERS ROTATING WITHIN MODERATE CLEARANCE RATIOS
O. Pinkus and I. Etsion Dec. 1973 34 p refs
(TAE-192) Avail: NTIS HC $4.75

The Navier-Stokes equations are examined for the flow of an incompressible fluid contained between rotating eccentric cylinders of finite length and moderate clearance ratios. Based on a modified form of the Reynolds equation an analytical solution for short cylinders, and numerical results for finite configurations are given for the range of Reynolds numbers and (C/R) ratios in which inertia forces can be neglected. Author

N74-21934*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL SOLUTION OF THE TIME-DEPENDENT COMPRESSIBLE NAVIER-STOKES EQUATIONS IN INLET REGIONS
L. E. Olson (Army Air Mobility Res. and Develop. Lab., Moffett

Field, Calif.), P. R. McGowan (Computer Sci. Corp., Mt. View, Calif.), and R. W. MacCormack. Mar. 1974 30 p refs
(NASA-TM-X-62338) Avail: NTIS HC $4.50 CSCL 20D

The results of a study to determine the effects of compressibility on the viscous flow through channels that have straight, parallel walls are presented. Two channel configurations are considered, the flow between two semi-infinite flat plates with uniform flow prescribed at the inlet plane and a cascade of semi-infinite flat plates with uniform flow introduced upstream. The flow field is modeled by using the time dependent, compressible Navier-Stokes equations. Time dependent solutions are obtained by using an explicit finite difference technique which advances the pressure on near field subsonic boundaries such that accurate steady state solutions are obtained. Steady state results at Reynolds number 20 and 150 are presented for Mach numbers between 0.09 and 0.36 and compared with the incompressible solutions of previous studies. Author

N74-21935*# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
THE APPLICATION OF RIEGELS' RULE AND TIME-LIKE DAMPING TO TRANSONIC FLOW CALCULATIONS
Donald Lee Herron Apr. 1974 24 p refs Presented at the 22d AIAA Southwestern Student Paper Competition, Arlington, Tex.
(Grant NGR-44-001-157)
(NASA-CR-138181; TAMRF-3033-7401) Avail: NTIS HC $4.25 CSCL 20D

Finite difference relaxation solutions of the nonlinear small perturbation equations have proven reliable and successful in determining the transonic flowfields about thin airfoils. However, application of the small perturbation approach to thick airfoils usually results in an accuracy less than desirable. The incorporation of Riegels' Rule and time-like damping into the small perturbation approach and their application to thick and thin airfoils in transonic flow are discussed. Studies for thick and thin airfoils are presented. It is concluded that Riegels' Rule and damping should both be included in small perturbation transonic flow calculations. Author

N74-21936*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPARISON OF MEASURED AND CALCULATED VELOCITY PROFILES OF A LAMINAR INCOMPRESSIBLE FREE JET AT LOW REYNOLDS NUMBERS
George C. Greene Washington May 1974 20 p refs
(NASA-TN-D-7510; L-9277) Avail: NTIS HC $3.00 CSCL 20D

A comparison of the measured and calculated velocity profiles of a laminar, incompressible, low Reynolds number jet is presented. The experimental jet was produced by a nozzle which consists of a porous metal plate covering the end of a pipe. This nozzle produces a uniform exit velocity profile at Reynolds numbers well below those at which conventional contoured nozzles are completely filled by the boundary layer. A jet mixing analysis based on the boundary-layer equations accurately predicted the velocity field for each test condition. The Reynolds number based on nozzle diameter ranged from 50 to 1000 with jet exit velocity either 30 or 61 m/s (100 or 200 ft/sec). Author

N74-21937*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WICKING OF LIQUIDS IN SCREENS
Eugene P. Symons Washington May 1974 33 p refs
(NASA-TN-D-7657; E-7781) Avail: NTIS HC $3.25 CSCL 20D

An investigation was conducted to determine the magnitude of the wicking rates of liquids in various screens. Evaluation of the parameters characterizing the wicking process resulted in the development of an expression which defined the wicking velocity in terms of screen and system geometry, liquid properties, and gravitational effects. Experiment data obtained both in normal gravity and in weightlessness demonstrated that the model successfully predicted the functional relation of the liquid properties and the distance from the liquid source to the wicking velocity. Because the pore geometry in the screens was complex, several screen geometric parameters were lumped into a single constant which was determined experimentally for each screen. Author

N74-21938*# Princeton Univ., N.J.
DISCRETE WALL JETS IN QUIESCENT AIR
J. D. McLean and H. J. Herring Washington NASA May 1974 45 p refs
(Grant NGL-31-001-074)
(NASA-CR-2388) Avail: NTIS HC $3.25 CSCL 20D

An experimental investigation was made of turbulent jet flows resulting from small, round nozzles discharging parallel to a smooth, flat wall in quiescent air. Nozzle axes were located 3.0 nozzle diameters above the wall surface. The case of a single nozzle and the case of a spanwise array of equally spaced nozzles were investigated. Several forms of approximate velocity profile similarity were noted, and the flow from the array of nozzles was seen to approach the form of a two-dimensional wall jet. Author

N74-21939# Lockheed Missiles and Space Co., Palo Alto, Calif.
GENERATION AND DIRECT VISCOUS DISSIPATION OF TURBULENT ENERGY
A. P. Ivanov 10 Aug. 1972 8 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (USSR), no. 6, 1973 p 30-36
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Computational relationships are presented for the generation and viscous dissipation of turbulent energy. The method applies to the whole stream section and the whole range of Reynolds number variation. The equation of average energy balance for the fluid flow in a circular pipe and plane channel is solved taking into account the equation of motion and the turbulent flow profile. Mathematical models are provided to support the theoretical concepts. Author

N74-21940*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF THROTTLING ON INTERFACE BEHAVIOR AND LIQUID RESIDUALS IN WEIGHTLESSNESS
Eugene P. Symons Washington NASA May 1974 21 p refs
(NASA-TM-X-3034; E-7833) Avail: NTIS HC $3.00 CSCL 20D

An experimental investigation was conducted to study liquid-vapor interface behavior and subsequent vapor ingestion in a flat-bottomed cylindrical tank following a single-step throttling in outflow rate in a weightless environment. A throttling process in which the final Weber number was one-tenth of the initial Weber number tended to excite large-amplitude symmetric slosh, with the amplitude generally increasing as initial Weber number increased. As expected, liquid residuals were lower than those obtained without throttling and, for moderate values of initial Weber number, could be adequately predicted by assuming that all draining took place at the final Weber number. At large values of Weber number, residuals tended to be lower than this predicted value. Author

N74-21941# Oak Ridge National Lab., Tenn.
FLUID DYNAMICS OF A SPHERICAL PARTICLE. TABULATION OF SETTING VELOCITY, REYNOLDS NUMBER, DRAG COEFFICIENT, RELAXATION TIME, AND ACCELERATION-DISTANCE IN AIR AND WATER
B. R. Fish and W. H. Wilkie Nov. 1973 172 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4100) Avail: NTIS HC $10.75

Various fluid dynamical parameters are calculated for spherical particles falling freely in air and in water. Tabulations include settling velocity, drag coefficient, and Reynolds number for particles from 1 to 1000 microns in diameter and having a buoyancy-corrected density of 1 to 12 g/cu cm. Author (NSA)

N74-21942# Los Alamos Scientific Lab., N.Mex.
METHOD FOR INCREASED ACCURACY IN EULERIAN FLUID DYNAMICS CALCULATIONS
W. C. Rivard, O. A. Farmer, T. D. Butler, and P. J. ORourke Oct. 1973 18 p refs
(Contract W-7405-eng-36)
(LA-5426-MS) Avail: NTIS HC $4.00

A method for increased accuracy in Eulerian fluid dynamics

calculations is described. The essence of the method is local cancellation of low-order, diffusional truncation errors. These errors are the source of nonlinear numerical instabilities. The methodology is described in general, and specific application is made to the transient, two-dimensional flow equations for chemically reacting mixtures. Two example problems are solved to illustrate the method. For comparison, the same problems are solved with an artificial viscosity technique. Author (NSA)

N74-21943# Battelle-Northwest, Richland, Wash. Pacific Northwest Labs.
FLOW PATTERNS IN SODIUM COLD TRAP CRYSTALLIZERS
D. H. Lester (Hanford Eng. Dev. Lab.) and G. R. Bloom Oct. 1973 22 p Presented at Joint Meeting of the Am. Nucl. Soc. and the Atomic Ind. Forum and Nucl. Energy Exhibition, San Francisco, 11 Nov. 1973 Sponsored by AEC
(BNWL-SA-4749; Conf-731101-35) Avail: NTIS HC $3.25

A simple, inexpensive flow distribution device is required for sodium cold trap crystallizers. The use of inlet mixing nozzles to promote uniform crystallizer flow distribution was investigated. Usually, the inlet to the crystallizer is a straight pipe entering at one point of the annulus. The work compared the conventional inlet nozzle to a 90 deg elbow pointing horizontally at the top of the annulus. The nozzle length between the bend and the outlet of the nozzle was two pipe diameters. The nozzle diameter was the same as the crystallizer inlet pipe. The flow patterns were evaluated using a water model of the crystallizer tank. The results indicate that modification of the crystallizer inlet pipe to a 90 deg elbow directed tangentially on the annulus centerline will produce significant improvement of flow distribution and should provide increased crystallizer volume effectiveness. The improvement is more pronounced at low flow rates than at high flow rates. Author (NSA)

N74-21944# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
ENERGY-MOMENTUM TENSOR FOR LIQUID
V. N. Streltsov 1973 16 p refs In RUSSIAN
(JINR-P2-7435) Avail: AEC Depository Libraries HC $3.00

Based on the analysis of the transformation formulas for the components of the energy-momentum tensor for ideal liquid it was shown that the requirement on the normal pressure invariance could hardly be considered acceptable, since, then, e.g., in the reference system, where this liquid is moving, the flux of transferred energy turns out to be equal to zero. It is pointed out also that the use of the conventional definition (vector) of the moving volume leads to the liquid at rest having a momentum differing from zero. The latter difficulty is overcome by another definition of the volume, applied previously to the case of the electromagnetic field of the classical electron.
Author (NSA)

N74-21945# European Space Research Organization, Paris (France).
INTERACTION BETWEEN A FLOW AND A VIBRATING BODY Ph.D. Thesis, Technische Univ., Berlin
R. Landl (DFVLR, Berlin) Mar. 1974 74 p refs Transl. into ENGLISH of Wechselwirkung zwischen einer Stroemung und einem schwingenden Koerper, DLR-FB-73-42, DFVLR, 2 Feb. 1973
(ESRO-TT-29; DLR-FB-73-42) Avail: NTIS HC $6.75; Original report in GERMAN: DFVLR, Porz, West Ger. 22,30 DM

Interactions between a flow and a mechanical oscillator are described. A dimensional analysis is presented which gives the governing parameters. Two kinds of interactions are discussed. The first case is that of a thin steel wire standing in a flow. The periodic wake produced by the wire caused it to perform self-excited oscillations. A simple mathematical model is given for this mechanism. The second case examines a cylindrical body which performs externally excited oscillations. A graph is presented showing superposition of an air flow perpendicular to the plane of vibration while changing the amplitude. Author (ESRO)

N74-21946# Illinois Univ., Urbana. Coordinated Science Lab.
BASIC GAS DYNAMIC EQUATIONS IN A MOVING ORTHOGONAL COORDINATE SYSTEM
C. J. Woan and T. J. Akai Nov. 1973 16 p refs
(Contract N00014-67-A-0305-0019)
(AD-774318; T-8; UILU-ENG-73-2233) Avail: NTIS CSCL 20/4

In the report the authors expand the basic gas dynamic equations written by Walkden in tensor form for an arbitrary moving coordinate system for the following specific systems: (1) Orthogonal moving, (2) Elliptic-cylindrical moving, and (3) Orthogonal stationary. (Modified author abstract) GRA

N74-21947# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A NUMERICAL SOLUTION OF INCOMPRESSIBLE TURBULENT CHANNEL FLOWS BY INVARIANT MODELING Ph.D. Thesis
Robert Poplawski Feb. 1974 197 p refs
(AD-775103; DS/AE/74-1) Avail: NTIS CSCL 20/4

A numerical technique was developed for incompressible turbulent channel flows which predicts the entire flow field downstream of any initial station. The technique includes any of the flow fields from a two-dimensional confined ejector region to the fully developed turbulent flow regime. The continuity, momentum, four one-point velocity correlations and a volumetric constraint equation are used as the fundamental governing equations. Closure is achieved by using Donaldson's Invariant Models which requires the specification of six constants to accommodate the experimental data. (Modified author abstract) GRA

N74-21948# California Univ., La Jolla. Dept. of Applied Mechanics and Engineering Sciences.
ON THE TWO-DIMENSIONAL MIXING REGION
F. H. Champagne Jun. 1973 97 p refs
(Grant AF-AFOSR-2287-72; AF Proj. 9781)
(AD-775052; AFOSR-74-0191TR) Avail: NTIS CSCL 20/4

An experimental investigation of the two-dimensional incompressible mixing layer was carried-out. The measurements provide new information on the development of the mean and turbulent fields towards a self-preserving state and on the higher-order statistical characteristics of the turbulent field. The relevance of initial conditions on the development of the flow is discussed in view of both present and previous data. Measurements of spectra, probability densities and moments to eighth order of all three velocity component fluctuations at various transverse position across the flow were carried-out using an on-line digital data acquisition system. The probability density distributions of the derivative and the derivative squared of the longitudinal and lateral velocity fluctuations were also determined. (Modified author abstract) GRA

N74-21949# Bell Aerospace Co., Buffalo, N.Y.
HIGH SPEED TURBULENT MIXING AND COMBUSTION Progress Report
J. H. Morgenthaler and G. Rudinger Nov. 1973 100 p refs
(Contract F44620-70-C-0116; AF Proj. 9711)
(AD-775055; BAC-9500-920316; AFOSR-74-0228TR) Avail: NTIS CSCL 07/4

Research results discussed are associated with investigations of turbulent mixing and combustion processes in advanced propulsion and laser systems. Momentum transport modeling for jets was completed. Review of analytical and experimental mixing literature was extended to chemical lasers. A unique analytical modeling approach applicable to practical hardware such as chemical lasers and sudden dump combustors is presented. A correlation was obtained for jet penetration of light and heavy gases injected into a subsonic cross flow through a narrow slot. Feasibility of obtaining combustion data for small boron particles near atmospheric pressure using shock-tube techniques was demonstrated, and ignition delay determined. (Modified author abstract) GRA

N74-21950# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
COMPUTER PROGRAMS FOR CALCULATING CONDENSATION RATE IN STEADY, ADIABATIC EXPANSIONS IN SUPERSONIC NOZZLES
Benjamin J. C. Wu Jan. 1974 120 p refs
(Contract N00014-67-A-0097-0012)
(AD-775257; TR-26) Avail: NTIS CSCL 20/4

The computer programs written in FORTRAN language for the numerical solution of supersonic nozzle flows with condensation are presented. These programs are based on Oswatitsch's formulation of one dimensional nozzle flow of ideal gases with subcritical heat addition. Integration of the coupled gasdynamic equations for the flow and the kinetic equations of condensation is done in a stepwise manner in the flow direction downstream from the throat, using a fourth order Runge-Kutta numerical integration algorithm. The nozzle cross-sectional area distribution, and physical properties of the vapor and condensate are written in separate sub-programs. The various forms of rate equations of homogeneous nucleation (classical or statistical mechanical) and free molecular droplet growth (for various ranges of droplet temperatures) are written in standard forms as several interchangeable subroutines. Detailed description of the program, flow charts, and sample calculations are included in the appendices.
Author (GRA)

N74-21951# Southwest Research Inst., San Antonio, Tex.
A GENERAL THEORY OF UNSTEADY LOADS ON CAVITATING HYDROFOILS Final Report, 15 Nov. 1971 - 15 Dec. 1973
James F. Unruh and Robert L. Bass Dec. 1973 85 p refs
(Contract N00014-72-C-0075; SwRI proj. 02-3271)
(AD-774994) Avail: NTIS CSCL 13/10

A general numerical approach using a doublet lattice-source representation for the prediction of unsteady loads on cavitating, general planform, finite aspect ratio hydrofoils is presented. Results for both super and partial cavitating foils of high aspect ratio are compared to the two-dimensional results of Woods and exhibit excellent agreement. Low aspect ratio results compare favorably with existing numerical approaches for supercavitating foils. Additional results for partially cavitating low aspect ratio foils are also presented. Author (GRA)

N74-21952# Harry Diamond Labs., Washington, D.C.
THE INTERPRETATION OF SURFACE STATIC PRESSURE DISTRIBUTIONS IN FLUID AMPLIFIER APPLICATIONS
Tadeusz M. Drzewiecki Jul. 1973 52 p refs
(DA Proj. 1T0-61102-A-33B)
(AD-774842; HDL-TR-1627) Avail: NTIS CSCL 13/7

The report presents a survey of basic flow fields typically found in fluid amplifiers and a summary of five fluid amplifier flow fields. The basic flow fields are presented in terms of the static pressure fields that they produce on bounding surfaces, in the form of lines of constant pressure. Formulas are given that require only a knowledge of the surface pressure and the geometry of the surface to yield quantitative approximations to the velocity fields beneath the surface. Data are also presented in terms of a transition parameter for the transition to turbulence of bounded jets. Knowledge of the basic fields is used in describing the flow fields in five different fluid amplifiers, three bistable and two proportional. (Modified author abstract) GRA

N74-21953# California Univ., Davis. Dept. of Mechanical Engineering.
THREE DIMENSIONAL FLOW STUDIES OVER A SPINNING CONE AT ANGLE OF ATTACK
H. A. Dwyer Feb. 1974 25 p refs
(Contract DAAD05-73-C-0039)
(AD-774795; BRL-CR-137) Avail: NTIS CSCL 20/4

Calculation of the boundary layer induced Magnus force on a spinning cone is given. A new technique to calculate the laminar boundary layer flow over a spinning cone at small angles of attack has been developed, and has yielded the information needed to calculate the Magnus force. The results include both the centrifugal pressure gradient and crossflow wall shear contributions to the Magnus force, and also give the boundary layer displacement thicknesses. (Modified author abstract) GRA

N74-21954# Naval Ship Research and Development Center, Bethesda, Md.
AN EXPERIMENTAL STUDY OF THE INTERMITTENT PROPERTIES OF THE BOUNDARY LAYER PRESSURE FIELD DURING TRANSITION ON A FLAT PLATE
Fred C. DeMetz and Mario J. Casarella Nov. 1973 131 p refs
(SF35452007)
(AD-775299; NSRDC-4140) Avail: NTIS CSCL 20/4

The properties of the intermittent wall pressure field were measured in the transition boundary layer on a large flat plate in an anechoic wind tunnel. Natural transition was achieved with a mild favorable pressure gradient at Reynolds numbers, based on downstream distance from the plate's leading edge, in excess of 7,000,000. The development of the laminar boundary layer prior to transition was in agreement with numerical solutions to the laminar boundary layer equations and with stability criteria for pressure gradient effects. The temporal, spatial, and spectral properties of the transition wall pressure field associated with the natural transition process occurring on the plate are obtained as a function of the intermittency factor, and compared with those of the fully turbulent pressure field. Specifically, the mean-square pressure, spectral densities, convection velocities, distributions of burst periods and burst rates of the intermittent pressure field are computed from the data. Author (GRA)

N74-21955# Naval Postgraduate School, Monterey, Calif.
BOTTOM AND SURFACE PROXIMITY EFFECTS ON THE ADDED MASS OF RANKINE OVOIDS M.S. Thesis
Monty George Fickel Dec. 1973 43 p refs
(AD-775022) Avail: NTIS CSCL 20/4

The free-surface and bottom-proximity effects on the added mass of Rankine ovoids of various length-to-diameter ratios were experimentally investigated by vertically oscillating the ovoids normal to their major axis. The results have shown that the bottom-proximity increases the added mass and the free-surface proximity decreases it. Furthermore, the added mass increases with increasing length-to-diameter ratio, i.e., for more cylinder-like ovoids, and approaches that predicted analytically for an infinitely long cylinder. (Modified author abstract) GRA

N74-21956# Naval Ship Research and Development Center, Bethesda, Md.
SURVEY OF THERMOCLINES AND DRAG-REDUCTION PROPERTIES OF WATER IN THE MAJOR BASINS AT THE NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER
N. Santelli Nov. 1973 23 p
(AD-774886; NSRDC-4089) Avail: NTIS CSCL 02/4

A systematic survey of temperature variation with depth was conducted in the David W. Taylor Model Basin (TMB) and the Maneuvering and Seakeeping (MASK) facilities at the Naval Ship Research and Development Center. Water samples from the basins were periodically tested for the presence of drag-reducing substances. A significant upper thermocline and an overall temperature gradient were found in the two basins of TMB. A weak, transient gradient was found in the seakeeping basin of MASK. No significant gradient could be found in the rotating-arm basin of MASK. Except for two highly transient occurrences in the drydock area of the rotating arm, none of the samples from the basins exhibited significantly lower drag. A tendency for slightly lower drag, 1% or less, was noted in the TMB basins. Precautions that are taken at the Center to prevent buildup of drag-reducing substances in the experimental facilities appear to be highly effective. (Modified author abstract) GRA

N74-21957# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SIMILITUDE CONDITIONS IN FREE-SURFACE VORTEX FORMATIONS Final Report
Larry L. Daggett and Garbis H. Keulegan Jan. 1974 39 p refs
(AD-775405; AEWES-Misc-Paper-H-74-1; AROD-I-425-1-EL)
Avail: NTIS CSCL 20/4

The report describes an investigation into the effects of fluid viscosity and surface tension on free-surface vortex flows and presents the results of this study. Experiments were conducted in two different sized cylindrical tanks with adjustable vanes at the perimetry to allow varying degrees of initial circulation to be generated at the entrance to the test section. Different fluids were used to investigate the effects of viscosity and surface tension on the incipient conditions for vortex formation and vortex size and shape. (Modified author abstract) GRA

N74-21958# Scripps Institution of Oceanography, La Jolla, Calif. Advanced Ocean Engineering Lab.

EXPERIMENTAL STUDY OF VORTICES GENERATED BY OSCILLATORY FLOW OVER RIPPLED SURFACES Ph.D. Thesis
Edward Brant Tunstall Dec. 1973 148 p refs
(Contract N00014-69-A-0200-6012; NR Proj. 293-005)
(AD-775514; AOEL-55) Avail: NTIS CSCL 20D

Vortices generated by oscillatory flow over asymmetrical and symmetrical ripples have been investigated. The vortices over asymmetrical ripples were investigated to study the possibility of using such ripple forms to control the direction of sand movement in the nearshore zone. The vortices over symmetrical ripples were investigated to ascertain the amount of wave energy loss that could be attributed to the formation of vortices. (Modified author abstract) GRA

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-21959*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Apr. 1974
Jack G. Quade, Principal Investigator Apr. 1974 2 p EREP
(Contract NAS9-13274)
(E74-10499; NASA-CR-136904) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-21960 California Univ., San Diego.
THE NORMAL MODES OF THE ROTATING, SELF-GRAVITATING INHOMOGENEOUS EARTH Ph.D. Thesis
Peter Ching Ho Luh 1973 186 p
Avail: Univ. Microfilms Order No. 74-6434

Because the earth's normal modes involve small deformations, the perturbation theory is used to find the solutions. To the zeroth-order the earth is approximated by a spherically symmetric, nonrotating, elastic, isotropic, and hydrostatic sphere, and is characterized by three radially inhomogeneous parameters, the density, the bulk modulus and the shear modulus. Any departures of this earth model from the real earth are treated as perturbations. Because of the symmetry in the earth model, the unperturbed modes form multiplets with varying degrees of degeneracy. For almost all of these multiplets, the perturbation calculation need be carried out to the first order. The perturbations considered consist of the earth's rotation, the ellipticity of figure, a continent-ocean discontinuity near the earth's surface, and an artificially contrived discontinuity about the core-mantle interface. Dissert. Abstr.

N74-21961 Pennsylvania State Univ., University Park. Ionospheric Research Lab.
CLASSIFIED LISTING OF IONOSPHERE RESEARCH LABORATORY SCIENTIFIC REPORTS
R. Divany and G. Spinelli 3 Jan. 1974 85 p refs
(PSU-IRL-SCI-400) Avail: Issuing Activity

An extensive bibliography covering ionospheric research and scientific reports is presented. Data are given on terrestrial space, interplanetary space, and wave propagation. Radiation studies, measurement techniques, and instrumentation and facilities for ionospheric measurement are included. E.H.W.

N74-21962*# Delaware Univ., Newark. Coll. of Marine Studies.
SKYLAB/EREP APPLICATION TO ECOLOGICAL, GEOLOGICAL AND OCEANOGRAPHIC INVESTIGATIONS OF DELAWARE BAY Bimonthly Technical Letter Progress Report, Feb. - Mar. 1974
V. Klemas, Principal Investigator 13 Mar. 1974 7 p refs EREP
(Contract NAS1-12304)
(E74-10437; NASA-CR-137416) Avail: NTIS HC $4.00 CSCL 08C

The author has identified the following significant results NASA's ERTS-1 satellite and Skylab-EREP have both provided imagery suitable for investigating coastal vegetation, land use, current circulation, water turbidity, waste disposal, and sea state. Based on high contrast targets, such as piers and breakwaters, the ERTS-1 MSS seems to have a resolution of 70-100 meters, Skylab's S190A about 30-70 meters, and its S190B about 10-30 meters. Important coastal land use details can be more readily mapped using Skylab's imagery. On the other hand, the regular eighteen day cycle of ERTS-1 allows observation of important man-made and natural changes, and facilitates collection of ground truth. The Skylab/EREP multispectral scanner offers 13 spectral bands as compared to 4 bands on ERTS-1. However, EREP scanner tapes require special filtering to remove several types of noise and their conical line scan pattern must be linearized before small targets can be identified based on spatial features.

N74-21963*# Boeing Co., Kent, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Mar. 1974
David L. Tingey, Principal Investigator Mar. 1974 1 p EREP
(Contract NAS9-13303)
(E74-10438; NASA-CR-137421) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-21964*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Mar. 1974
Roger M. Hoffer, Principal Investigator Mar. 1974 6 p EREP
(Contract NAS9-13380)
(E74-10439; NASA-CR-137422) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-21965*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
AUTOMATED LAND-USE MAPPING FROM SPACECRAFT DATA Special Report
Phillip E. Chase, Principal Investigator, Robert H. Rogers, and Larry E. Reed Mar. 1974 16 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21810)
(E74-10440; NASA-CR-137423) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. In response to the need for a faster, more economical means of producing land use maps, this study evaluated the suitability of using ERTS-1 computer compatible tape (CCT) data as a basis for automatic mapping. Significant findings are: (1) automatic classification accuracy greater than 90% is achieved on categories of deep and shallow water, tended grass, rangeland, extractive (bare earth), urban, forest land, and nonforested wet lands; (2) computer-generated printouts by target class provide a quantitative measure of land use; and (3) the generation of map overlays showing land use from ERTS-1 CCTs offers a significant breakthrough in the rate at which land use maps are generated. Rather than uncorrected classified imagery or computer line printer outputs, the processing results in geometrically-corrected computer-driven pen drawing of land categories, drawn on a transparent material at a scale specified by the operator. These map overlays are economically produced and provide an efficient means of rapidly updating maps showing land use.

N74-21966*# National Environmental Satellite Service, Washington, D.C.
A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA Quarterly Progress Report, Jan. - Mar. 1974
John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Mar. 1974 4 p EREP

(NASA Order T-4715-B)
(E74-10441; NASA-CR-137424; QPR-4) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-21967*# American Univ., Washington, D.C.
PRELIMINARY REPORT ON SAND-STREAMING IN AGADEZ AND TAHOUA DEPARTMENTS, REPUBLIC OF NIGER
N. H. MacLeod, Principal Investigator, J. S. Schubert, R. A. Finale, and D. D. Kurtz [1974] 1 p ERTS
(Contract NAS5-21889)
(E74-10442; NASA-CR-137425) Avail: NTIS HC $4.00 CSCL 08M

There are no author-identified significant results in this report.

N74-21968*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Report, Mar. 1974
George A. Maul, Principal Investigator Mar. 1974 3 p EREP
(NASA Order T-4713-B)
(E74-10443; NASA-CR-137426; MR-9) Avail: NTIS HC $4.00 CSCL 08C

There are no author-identified significant results in this report.

N74-21969*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Mar. 1974
Irvin J. Sattinger, Principal Investigator 10 Apr. 1974 3 p EREP
(Contract NAS9-13283)
(E74-10444; NASA-CR-137433; ERIM-103300-23-L) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. SI90B color photography has adequate resolution to detect or identify many natural and cultural features which are significant for the evaluation of recreational land and open space. The effectiveness of the interpretation could be improved if coverage were obtained at two or three different seasons so that indicators such as seasonal changes in vegetation cover or snow enhancement could aid the interpretation of land use and land cover. The degree of detail which can be observed from SI90B photography makes it useful for the following purposes: (1) Photography can be used to obtain general familiarity with a large regional area, and to study interrelationships of major natural and cultural features within the area. (2) Existing recreational facilities such as golf courses, parks, stadiums, race tracks, and marinas can be detected and identified. (3) The photography can be used for initial selection of recreation sites. (4) It would also indicate trends in population growth, which constitute one type of information needed in estimating the growth of recreation demand. The photography has only limited use for planning individual site planning of parks, golf courses, and other recreation facilities.

N74-21970*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Mar. 1974
Richard F. Nalepka and William A. Malila, Principal Investigators 10 Apr. 1974 3 p EREP
(Contract NAS9-13280)
(E74-10445; NASA-CR-137434; ERIM-101900-28-L; MPR-13) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-21971*# Earth Satellite Corp., Berkeley, Calif.
EVALUATION OF USEFULNESS OF SKYLAB EREP S-190 AND S-192 IMAGERY IN MULTISTAGE FOREST SURVEYS Progress Report, 1 Oct. 1973 - 31 Mar. 1974
Philip G. Langley, Principal Investigator 31 Mar. 1974 11 p EREP
(Contract NAS9-13289)
(E74-10446; NASA-CR-137435; PR-6) Avail: NTIS HC $4.00 CSCL 02F

The author has identified the following significant results. The digital timber volume prediction system was tested with another test area in the Trinity Alps. The estimated gain in precision was somewhat lower than the estimate for the first test area (35%). A combined interpretation of the two areas was made, yielding an estimated gain of 44%, with high statistical significance. This interpretation was used to calibrate the system for an interpretation of 43 primary sample units distributed over 1600 square miles. Preliminary results indicate that a gain of 35% can be realized over this large area in northern California.

N74-21972*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1-31 Mar. 1974
A. G. Mourad and D. M. J. Fubara, Principal Investigators 17 Apr. 1974 9 p refs EREP
(Contract NAS9-13276)
(E74-10447; NASA-CR-137436; PR-13) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-21973*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Progress Report, 1 Oct. 1973 - 31 Mar. 1974
John W. Hannah, Garland L. Thomas, and Ferd Esparza, Principal Investigators 31 Mar. 1974 27 p refs Prepared in cooperation with Brevard County Planning Dept., Titusville, Fla. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21847)
(E74-10448; NASA-TM-X-70152) Avail: NTIS HC $4.50 CSCL 08B

There are no author-identified significant results in this report.

N74-21974*# Geological Survey, Reston, Va.
OVERALL EVALUATION OF SKYLAB (EREP) IMAGES FOR CARTOGRAPHIC APPLICATION Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
Alden P. Colvocoresses, Principal Investigator 1 Apr. 1974 13 p refs EREP
(NASA Order S-70243-AG-2)
(E74-10449; NASA-CR-137438) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. The importance of photomap products derived from Skylab type imagery for portrayal of previously unmapped (or poorly mapped) areas is recognized as truly significant. Updating of maps of any scale from Skylab type imaging can only be accomplished on a selective basis. Relative positional accuracy commensurate with 1:100,000 scale (SI90A) or even 1:50,000 (S190B) is considered correct. However, many features required on such maps cannot be properly identified or classified from such imagery. The comprehensive updating of larger scale maps requires supplementary photography or ground truth.

N74-21975*# Ohio Dept. of Economic and Community Development, Columbus.
[EVALUATE THE POTENTIAL OF SKYLAB PHOTOGRAPHIC AND INFRARED IMAGERY FOR ENVIRONMENTAL QUALITY, AGRICULTURAL AND FORESTRY, AND GEOGRAPHIC APPLICATIONS IN THE STATE OF OHIO] Quarterly Progress Report, Jan. - Mar. 1974
David C. Sweet, Principal Investigator 10 Apr. 1974 18 p EREP
(NASA Order C-21372-C)
(E74-10450; NASA-CR-137439) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-21976*# Environmental Research Inst. of Michigan, Ann Arbor.
SKYLAB SUPPORT Progress Report, Apr. 1973 - Feb. 1974
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators, and Richard F. Nalepka 18 Mar. 1974 . 2 p Prepared in cooperation with Mich. State Univ. EREP
(Contract NAS9-13332)
(E74-10451; NASA-CR-137440; ERIM-104600-10-L) Avail: NTIS HC $4.00 CSCL 05A

There are no author-identified significant results in this report.

N74-21977*# Science Applications, Inc., La Jolla, Calif.
DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE FROM ERTS-1 DATA Final Report, 7 Sep. 1972 - 6 Oct. 1973
M. Griggs, C. B. Ludwig, and W. Malkmus, Principal Investigators 23 Oct. 1973 55 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21860)
(E74-10452; NASA-CR-137441; SAI-73-625-LJ) Avail: NTIS HC $5.75 CSCL 04A

The author has identified the following significant results. Significant results, relating the radiance over water surfaces to the atmospheric aerosol content, have been obtained. The results indicate that the MSS channels 4, 5, and 6 centered at 0.55, 0.65, and 0.75 microns have comparable sensitivity, and that the aerosol content can be determined within + or - 10% with the assumed measurement errors of the MSS. The fourth channel, MSS 7, is not useful for aerosol determination due to the water radiance values from this channel generally being less than the instrument noise. The accuracy of the aerosol content measurement could be increased by using an instrument specifically designed for this purpose. This radiance-aerosol content relationship can possibly provide a basis for monitoring the atmospheric aerosol content on a global basis, allowing a base-line value of aerosols to be established. The contrast-aerosol content investigation shows useful linear relationships in MSS channels 4 and 5, allowing the aerosol content to be determined within + or - 10%. MSS 7 is not useful due to the low accuracy in the water radiance, and MSS 6 is found to be too insensitive. These results rely on several assumptions due to the lack of ground truth data, but do serve to indicate which channels are most useful.

N74-21978*# Corps of Engineers, Waltham, Mass.
ERTS-1 DATA USER INVESTIGATION OF THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Progress Report, 14 Dec. 1973 - 14 Feb. 1974
Saul Cooper and Paul Bock, Principal Investigators 22 Apr. 1974 3 p ERTS
(NASA Order S-70256-AG)
(E74-10453; NASA-CR-137442) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-21979*# City Coll. of the City of New York. Univ. Inst. of Oceanography.
A JOINT METEOROLOGICAL, OCEANOGRAPHIC AND SENSOR EVALUATION PROGRAM FOR EXPERIMENT S193 ON SKYLAB Monthly Plans and Progress Report, period ending 18 Apr. 1974
Willard J. Pierson, R. K. Moore, and E. P. McClain, Principal Investigators 18 Apr. 1974 2 p EREP
(Contract NAS9-13642)
(E74-10454; NASA-CR-137443) Avail: NTIS HC $4.00 CSCL 14B

There are no author-identified significant results in this report.

N74-21980*# Iowa Univ., Iowa City. Dept. of Geology.
EXPERIMENT TO EVALUATE FEASIBILITY OF UTILIZING SKYLAB-EREP REMOTE SENSING DATA FOR TECTONIC ANALYSIS OF THE BIGHORN MOUNTAINS REGION, WYOMING-MONTANA Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
Richard A. Hoppin, Principal Investigator 15 Apr. 1974 4 p EREP
(Contract NAS9-13313)
(E74-10455; NASA-CR-137444) Avail: NTIS HC $4.00 CSCL 08F

The author has identified the following significant results. Analysis of SL-3, S-190A, and S-190B color frames indicates two sets of linears obliquely cutting across the east-west trending Owl Creek-Bridger uplifts. A northwest set of faults and folds has been mapped previously but the imagery indicates some changes and addition of detail can be made. A less pronounced east-northeast set of linear alignments (drainage segments, lithologic contacts, possible faults) extends into the southeast part of the Big Horn Basin.

N74-21981*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
OPTICAL DATA PROCESSING ANALYSIS OF STREAM PATTERNS EXHIBITED ON ERTS-1 IMAGERY
Fawwaz T. Ulaby, Principal Investigator, John C. Davis, Dwight D. Egbert, James R. McCauley, and James L. McNaughton 23 Apr. 1974 18 p refs Presented at 9th Intern. Symp. on Remote Sensing of Environ., Ann Arbor, Mich., 15-19 Apr. 1974 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21822)
(E74-10456; NASA-CR-137445) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-21982*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
GROUND PATTERN ANALYSIS IN THE GREAT PLAINS Semiannual Progress Report, 1 Aug. 1973 - 31 Jan. 1974
Fawwaz T. Ulaby, John C. Davis, Principal Investigators, James L. McNaughton, Dwight D. Egbert, and James R. McCauley Jan. 1974 44 p refs ERTS
(Contract NAS5-21822)
(E74-10457; NASA-CR-137446; Rept-2266-9) Avail: NTIS HC $5.25 CSCL 08E

There are no author-identified significant results in this report.

N74-21983*# Corps of Engineers, Champaign, Ill.
EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 9 Feb. - 8 Apr. 1974
Ravinder K. Jain, Principal Investigator 8 Apr. 1974 1 p ERTS
(NASA Order S-70255-AG)
(E74-10458; NASA-CR-137447) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-21984*# National Ocean Survey, Rockville, Md. Photogrammetric Research Branch.
SKYLAB A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY Quarterly Report, 15 Jan. - 15 Apr. 1974
Morton Keller, Principal Investigator 15 Apr. 1974 1 p EREP
(NASA Order T-4110-B)
(E74-10459; NASA-CR-137448) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-21985*# Geological Survey, Bay Saint Louis, Miss.
THE HYDROLOGIC SIGNIFICANCE OF FAULTS IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK Quarterly Progress Report, 1 Dec. 1973 - 28 Feb. 1974
Gerald K. Moore and Este F. Hollyday, Principal Investigators 28 Feb. 1974 4 p EREP
(NASA Order H-2810-B)

(E74-10460; NASA-CR-137449) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-21986*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 10 Mar. - 10 Apr. 1974
K. J. Savastano, Principal Investigator 12 Apr. 1974 3 p EREP
(NASA Order T-8217-B)
(E74-10461; NASA-CR-137450; MPR-11) Avail: NTIS HC $4.00 CSCL 08A

There are no author-identified significant results in this report.

N74-21987*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Feb. 1974
Allan Shapiro, Principal Investigator 2 Apr. 1974 3 p EREP
(NASA Order T-4716-B)
(E74-10462; NASA-CR-137451) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-21988*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Quarterly Progress Report, Dec. 1973 - Feb. 1974
Charles W. Welby, Principal Investigator 8 Apr. 1974 2 p EREP
(Contract NAS9-13321)
(E74-10463; NASA-CR-137452) Avail: NTIS HC $4.00 CSCL 0°B

There are no author-identified significant results in this report.

N74-21989*# South Carolina State Development Board, Columbia.
APPLICATION OF MULTISPECTRAL PHOTOGRAPHY TO MINERAL AND LAND RESOURCES OF SOUTH CAROLINA Quarterly Progress Report
Norman K. Olson, Principal Investigator 5 Apr. 1974 18 p EREP
(Contract NAS8-29617)
(E74-10464; NASA-CR-137453; QPR-3) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-21990*# Wolf Research and Development Corp., Pocomoke City, Md.
APPLICABILITY OF SKYLAB REMOTE SENSING FOR DETECTION AND MONITORING OF SURFACE MINING ACTIVITIES Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
R. L. Brooks, Principal Investigator and J. D. Pennewell Apr. 1974 7 p EREP
(Contract NAS9-13310)
(E74-10465; NASA-CR-136866; QPR-4) Avail: NTIS HC $4.00 CSCL 08I

There are no author-identified significant results in this report.

N74-21991*# Kansas Univ. Center for Research, Inc., Lawrence.
SKYLAB STUDY OF WATER QUALITY Progress Report, Dec. 1973 - Feb. 1974
Harold L. Yarger, Principal Investigator and James R. McCauley Feb. 1974 11 p EREP
(Contract NAS9-13271)
(E74-10466; NASA-CR-136867) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-21992*# Geological Survey, Reston, Va.
SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND Progress Report, 1 Sep. 1973 - 28 Feb. 1974
Richard S. Williams, Jr., Principal Investigator 1 Mar. 1974 49 p refs ERTS
(NASA Order S-70243-AG)
(E74-10467; NASA-CR-136868) Avail: NTIS HC $5.50 CSCL 08G

The author has identified the following significant results. ERTS-1 imagery provides sufficient resolution to discern two effects of geothermal activity at the Namafjall geothermal area: snowmelt anomalies and delineation of altered ground. The fallout pattern of tephra from Hekla's 1970 volcanic eruption can be mapped where sufficient depth of deposition destroyed the vegetation. Lava flows from the volcanic eruptions at Askja and Hekla can be delineated. Low sun-angle imagery of snow-covered terrain has permitted the mapping of new structural and volcanic features beneath the icecaps. Coastline changes on the islands of Surtsey and Heimaey can be mapped. Variations of sediment plumes from glacial rivers on the south coast give a qualitative indication of seasonal changes in melting rates of glaciers. ERTS-1 imagery has been shown to be especially amenable to portrayal of changing glaciological phenomena: surging glaciers, collapse features in icecaps caused by subglacial volcanic (?) and geothermal activity and resulting jokulhlaups, and variations in size of glacier-margin lakes. A fifth vegetation class has now been added: lichen-covered bedrock. The high latitude permits more precise analysis of landforms, vegetation distribution, occurrence of snow cover, glaciers, and geologic structure.

N74-21993*# Bureau of Reclamation, Denver, Colo.
MONITOR WEATHER CONDITIONS FOR CLOUD SEEDING CONTROL Progress Report, 1 Jan. - 28 Feb. 1974
Archie M. Kahan, Principal Investigator 1 Mar. 1974 6 p refs ERTS
(NASA Order S-70243-AG-8)
(E74-10468; NASA-CR-136869) Avail: NTIS HC $4.00 CSCL 04B

There are no author-identified significant results in this report.

N74-21994*# Geological Survey, Tacoma, Wash.
EVALUATE ERTS IMAGERY FOR MAPPING AND DETECTION OF CHANGES OF SNOWCOVER ON LAND AND ON GLACIERS Progress Report, 1 Jan. - 28 Feb. 1974
Mark F. Meier, Principal Investigator 28 Feb. 1974 4 p ERTS
(NASA Order S-70243-AG-2)
(E74-10469; NASA-CR-136870) Avail: NTIS HC $4.00 CSCL 08L

The author has identified the following significant results. The area of snowcover on 10 individual drainage basins in the North Cascades, Washington, has been determined by use of a semi-automatic radiance threshold technique. The result is a unique record of the changing water storage as snow in these important hydrologic units, the runoff of which is utilized for hydroelectric power, dilution of wastes and heat, support of salmon migration, and irrigation. These data allow a new type of hydrologic modelling to proceed which should permit more accurate forecasts of streamflow. A new technique has been developed for measuring snow-covered area or snowline altitude semi-automatically. This variable contour overlay method permits the snowcover to be matched efficiently to the best fit contour of altitude. The motion of the Yentna Glacier during the concluding phase of its surge was successfully measured by a flicker technique using images of two dates. It appears that displacements as small as 100 to 200 m can be measured. Motion of the Tweedsmuir Glacier in Alaska was measured using ERTS-1 images enlarged to 1:50,000. Changes detected included a shock wave moving down the glacier, the margin expanding, the moraine pattern deforming, and the marginal valley deepening.

N74-21995*# Geological Survey, Reston, Va.
THE CARTOGRAPHIC APPLICATION OF ERTS/RBV IMAGERY IN POLAR REGIONS Progress Report, 1 Jan. - 28 Feb. 1974
William R. MacDonald, Principal Investigator 1 Mar. 1974 3 p ERTS
(NASA Order S-70243-AG-2)
(E74-10470; NASA-CR-136871) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. Preliminary analysis of the late 1973-74 Antarctic imagery, when compared to 1972-73 imagery and existing map sources, clearly shows changes in the ice fronts, glacier movement, and the existence of possible new geographical features.

N74-21996*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[SPECTRORADIOMETRIC MEASUREMENTS OF LAKE MONROE, INDIANA] Monthly Report, Jun. 1973
LeRoy F. Silva, Principal Investigator Jun. 1973 2 p EREP
(Contract NAS9-13301)
(E74-10472; NASA-CR-136873) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-21997*# Geological Survey, Reston, Va. Geographic Applications Program.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, Jan. - Mar. 1974
Robert H. Alexander, Principal Investigator and Valerie A. Milazzo 20 Mar. 1974 6 p EREP
(NASA Order T-5290-B)
(E74-10473; NASA-CR-136874) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-21998*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
EVALUATION AND COMPARISON OF ERTS MEASUREMENTS OF MAJOR CROPS AND SOIL ASSOCIATIONS FOR SELECTED TEST SITES IN THE CENTRAL UNITED STATES Final Report, 1 Jul. 1972 - 19 Feb. 1974
Marion F. Baumgardner, Principal investigator 19 Mar. 1974 174 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21785)
(E74-10474; NASA-CR-136875) Avail: NTIS HC $11.75 CSCL 02C

The author has identified the following significant results. Multispectral scanner data obtained by ERTS-1 over six test sites in the Central United States were analyzed and interpreted. ERTS-1 data for some of the test sites were geometrically corrected and temporally overlayed. Computer-implemented pattern recognition techniques were used in the analysis of all multispectral data. These techniques were used to evaluate ERTS-1 data as a tool for soil survey. Geology maps and land use inventories were prepared by digital analysis of multispectral data. Identification and mapping of crop species and rangelands were achieved throught the analysis of 1972 and 1973 ERTS-1 data. Multiple dates of ERTS-1 data were examined to determine the variation with time of the areal extent of surface water resources on the Southern Great Plain.

N74-21999*# Mitre Corp., McLean, Va.
INVESTIGATION OF ENVIRONMENTAL INDICES FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE Final Report, Aug. 1972 - Feb. 1974
Richard S. Greeley, Principal Investigator, E. A. Ward, J. C. Elliott, E. J. Friedman, E. L. Riley, and S. Stryker Feb. 1974 393 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21842)
(E74-10475; NASA-CR-136876; M74-37) Avail: NTIS HC $22.75 CSCL 05B

The author has identified the following significant results. Land use change, water quality, and air quality indices have been calculated from analysis of ERTS-1 multispectral scanning imagery and computer compatible tapes. Specifications have been developed and discussed for an ERTS-1 environmental monitoring system which help to serve the information needs of environmental managers at the Federal, state, regional, and local level. General conclusions of the investigation are that ERTS-1 data is very useful in land use mapping and updating to 10-15 categories, and can provide an overall measure of air and water turbidity; however, more and better ground truth and possibly additional spacecraft sensors will be required if specific air and water pollutants are to be quantified from satellite data.

N74-22000*# Environmental Research and Technology, Inc., Lexington, Mass.
STUDY TO DEVELOP IMPROVED SPACECRAFT SNOW SURVEY METHODS USING SKYLAB/EREP DATA Quarterly Progress Report, 15 Dec. 1973 - 15 Mar. 1974
James C. Barnes, Principal Investigator May 1974 9 p EREP
(Contract NAS9-13305)
(E74-10476; NASA-CR-136877; ERT-P-412-6; QPR-4) Avail: NTIS HC $4.00 CSCL 08L

The author has identified the following significant results. A segment of the interim S192 film product from the SL-2 mission has been examined. The film covers the White Mountains area near the California-Nevada border and contains useable data for spectral bands: band 3, band 7, band 9, and band 11. Whereas the snow surface exhibits wide variations in reflectance, no significant change in the reflectance of the clouds occurs over the spectral range of these four bands. In band 11 the clouds appear white and snow appears black; in the band 3 data, both the clouds and the snow appear white. Two potential applications are possible, based on these results. First, because the reflectance of the snow surface in the band 9 data is much lower at the lower elevation terrain of the White Mountains, it appears that the drop in reflectance in the near-IR portion of the spectrum may be related to the wetness of the snow surface. Secondly, the complete reversal in reflectance that is observed in band 11 data indicates that in this portion of the spectrum snow surfaces have a low reflectance regardless of the condition of the snow. Because clouds do not exhibit a similar drop in reflectance, measurements in this spectral band have potential use for automatically distinguishing snow from clouds.

N74-22001*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Plans and Progress Report, Mar. 1974
Lester V. Manderscheid, Principal Investigator Mar. 1974 2 p EREP
(Contract NAS9-13332)
(E74-10477; NASA-CR-136878) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-22002*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
DETERMINATION OF THE EARTH'S AEROSOL ALBEDO USING SKYLAB DATA Quarterly Progress Report
Robert E. Turner, Principal Investigator 11 Apr. 1974 2 p EREP
(Contract NAS9-13279)
(E74-10478; NASA-CR-136881; ERIM-102200-9-L; QPR-4) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-22003*# National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
PRELIMINARY RESULTS OF FISHERIES INVESTIGATION ASSOCIATED WITH SKYLAB-3
K. J. Savastano, Principal Investigator, E. Pastula, Jr., G. Woods, and K. Faller 15 Apr. 1974 31 p refs Prepared in cooperation with Natl. Marine Fisheries Serv., Bay Saint Louis, Miss. EREP (NASA Order T-8217-B)
(E74-10479; NASA-TM-X-70009) Avail: NTIS HC $4.75 CSCL

08A

The author has identified the following significant results. This investigation is to establish the feasibility of utilizing remotely sensed data acquired from aircraft and satellite platforms to provide information concerning the distribution and abundance of oceanic gamefish. Data from the test area in the northeastern Gulf of Mexico has made possible the identification of fisheries significant environmental parameters for white marlin. Predictive models based on catch data and surface truth information have been developed and have demonstrated potential for reducing search significantly by identifying areas which have a high probability of being productive. Three of the parameters utilized by the model, chlorophyll-a, sea surface temperature, and turbidity have been inferred from aircraft sensor data. Cloud cover and delayed receipt have inhibited the use of Skylab data. The first step toward establishing the feasibility of utilizing remotely sensed data to assess amd monitor the distribution of ocean gamefish has been taken with the successful identification of fisheries significant oceanographic parameters and the demonstration of the capability of measuring most of these parameters remotely.

N74-22004*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Jan. 1974
Kenneth Watson, Principal Investigator Jan. 1974 3 p EREP
(NASA Order T-6555-B)
(E74-10480; NASA-CR-136883) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-22005*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Mar. 1974
Kenneth Watson, Principal Investigator Mar. 1974 2 p EREP
(NASA Order T-6555-B)
(E74-10481; NASA-CR-136884) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-22006*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Feb. 1974
Kenneth Watson, Principal Investigator Feb. 1974 2 p EREP
(NASA Order T-6555-B)
(E74-10482; NASA-CR-136885) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-22007*# Ohio Dept. of Economic and Community Development, Columbus.
RELEVANCE OF ERTS TO THE STATE OF OHIO Progress Report, Jan. - Feb. 1974
David C. Sweet, Principal Investigator Feb. 1974 14 p Prepared for Battelle Columbus Labs. ERTS
(Contracts NAS5-21782; BCL-72-17/G-1793)
(E74-10483; NASA-CR-136879) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-22008*# Arizona Univ., Tucson.
EVALUATION OF ERTS-1 IMAGE SENSOR SPATIAL RESOLUTION IN PHOTOGRAPHIC FORM Progress Report, 1 Jan. - 1 Mar. 1974
P. N. Slater, Principal Investigator, R. L. Antos, and R. A. Schowengerdt Apr. 1974 19 p ERTS
(Contract NAS5-21849)
(E74-10484; NASA-CR-136880; PR-9) Avail: NTIS HC $4.00 CSCL 14E

There are no author-identified significant results in this report.

N74-22009*# Corps of Engineers, Waltham, Mass.
THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Interim Report, Jul. - Dec. 1973
Saul Cooper, Principal Investigator Jan. 1974 30 p ERTS
(NASA Order S-70256-AG)
(E74-10485; NASA-CR-136886) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-22010*# South Dakota State Univ., Brookings. Remote Sensing Inst.
[DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL] Monthly Report, period ending 1 Apr. 1974
Victor I. Myers, Principal Investigator 1 Apr. 1974 2 p EREP
(Contract NAS9-13337)
(E74-10486; NASA-CR-136887) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-22011*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Mar. 1974
Kennan Lee, Principal Investigator 20 Apr. 1974 5 p refs EREP
(Contract NAS9-13394)
(E74-10487; NASA-CR-136888) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-22012*# Bureau of Sport Fisheries and Wildlife, Jamestown, N. Dak. Northern Prairie Wildlife Research Center.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Apr. 1974
Harvey K. Nelson, Principal Investigators Apr. 1974 2 p EREP
(NASA Order T-4114-B)
(E74-10488; NASA-CR-136889) Avail: NTIS HC $4.00 CSCL 06C

There are no author-identified significant results in this report.

N74-22013*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS Special Report
Robert H. Rogers, Principal Investigator, Keith Peacock, and Navinchandra J. Shah Apr. 1974 21 p refs ERTS
(Contract NAS5-21863)
(E74-10489; NASA-CR-136890) Avail: NTIS HC $4.25 CSCL 05B

The author has identified the following significant results. Based on processing ERTS CCTs and ground truth measurements collected on Michigan test site for January through June 1973 the following results are reported: (1) atmospheric transmittance varies from: 70 to 85% in band 4, 77 to 90% in band 5, 80 to 94% in band 6, and 84 to 97% in band 7 for one air mass; (2) a simple technique was established to determine atmospheric scattering seen by ERTS-1 from ground-based measurements of sky radiance. For March this scattering was found to be equivalent to that produced by a target having a reflectance of 11% in band 4, 5% in band 5, 3% in band 6, and 1% in band 7; (3) computer ability to classify targets under various atmospheric conditions was determined. Classification accuracy on some targets (i.e. bare soil, tended grass, etc.) hold up even under the most severe atmospheres encountered, while performance on other targets (trees, urban, rangeland, etc.) degrades rapidly when atmospheric conditions change by the smallest amount.

N74-22014*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
AUTOMATED STRIP-MINE AND RECLAMATION MAPPING

FROM ERTS Special Report
Robert H. Rogers, Principal Investigator, Larry E. Reed (Ohio State Univ.), and Wayne A. Pettyjohn Apr. 1974 15 p Original contains imagery. Original photography may be purchased from the EROS DATA Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21762)
(E74-10490; NASA-CR-136891) Avail: NTIS HC $4.00 CSCL 08I

The author has identified the following significant results. Computer processing techniques were applied to ERTS-1 computer-compatible tape (CCT) data acquired in August 1972 on the Ohio Power Company's coal mining operation in Muskingum County, Ohio. Processing results succeeded in automatically classifying, with an accuracy greater than 90%: (1) stripped earth and major sources of erosion; (2) partially reclaimed areas and minor sources of erosion; (3) water with sedimentation; (4) water without sedimentation; and (5) vegetation. Computer-generated tables listing the area in acres and square kilometers were produced for each target category. Processing results also included geometrically corrected map overlays, one for each target category, drawn on a transparent material by a pen under computer control. Each target category is assigned a distinctive color on the overlay to facilitate interpretation. The overlays, drawn at a scale of 1:250,000 when placed over an AMS map of the same area, immediately provided map locations for each target. These mapping products were generated at a tenth of the cost of conventional mapping techniques.

N74-22015*# California Univ., Berkeley. Remote Sensing Research Program.
AGRICULTURAL INTERPRETATION TECHNIQUE DEVELOPMENT Quarterly Progress Report
Robert N. Colwell, Andrew S. Benson, Principal Investigators, Catherine E. Brown, Claire M. Hay, and Nancy A. Jones 28 Feb. 1974 14 p Original contains color illustrations EREP
(Contract NAS2-7567)
(E74-10491; NASA-CR-136892) Avail: NTIS HC $4.00 CSCL 02C

There are no author-identified significant results in this report.

N74-22016*# Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
WATER SURVEY OF CANADA: APPLICATION FOR USE OF ERTS-A FOR RETRANSMISSION OF WATER RESOURCES DATA Progress Report, Oct. 1973 - Mar. 1974
R. A. Halliday, Principal Investigator and I. A. Reid Apr. 1974 7 p Sponsored by NASA ERTS
(E74-10492; NASA-CR-136893; SR-9629) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-22017*# Wyoming Univ., Laramie. Dept. of Geology.
RANGE VEGETATION TYPE MAPPING AND ABOVE-GROUND GREEN BIOMASS ESTIMATIONS USING MULTISPECTRAL IMAGERY Special Report
Robert S. Houston, Principal Investigator and Robert C. Gordon 20 Apr. 1974 17 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E74-10493; NASA-CR-136894) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. Range vegetation types have been successfully mapped on a portion of the 68,000 acre study site located west of Baggs, Wyoming, using ERTS-1 imagery. These types have been ascertained from field transects over a five year period. Comparable studies will be made with EREP imagery. Above-ground biomass estimation studies are being conducted utilizing double sampling techniques on two similar study sites. Information obtained will be correlated with percent relative reflectance measurements obtained on the ground which will be related to image brightness levels. This will provide an estimate of above-ground green biomass with multispectral imagery.

N74-22018*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON SKYLAB AND SUPPORTING AIRCRAFT DATA Quarterly Progress Report
Robert N. Colwell, Principal Investigator 28 Feb. 1974 9 p EREP
(Contract NAS2-7562)
(E74-10495; NASA-CR-136899) Avail: NTIS HC $4.00 CSCL 08F

Skylab data has been used: (1) as an aid to resource management in Northern California; (2) to assess and monitor change in the Southern California environment; and (3) for resource inventory and analysis of The California Desert Program. For individual titles, see N74-22019 through N74-22020.

N74-22019* California Univ., Berkeley. Space Sciences Lab.
SKYLAB DATA AS AN AID TO RESOURCE MANAGEMENT IN NORTHERN CALIFORNIA
Robert N. Colwell, James D. Nichols, Principal Investigators, Michael J. Gialdini, and Sharon L. Wall *In its* An Integrated Study of Earth Resources in the State of the Calif. Based on Skylab and Supporting Aircraft Data 28 Feb. 1974 3 p EREP (For availability see N74-22018 13-13)
CSCL 08F

There are no author-identified significant results in this report.

N74-22020* California Univ., Riverside. Dept. of Earth Sciences.
USE OF SKYLAB DATA TO ASSESS AND MONITOR CHANGE IN THE SOUTHERN CALIFORNIA ENVIRONMENT; THE CALIFORNIA DESERT PROGRAM - RESOURCE INVENTORY AND ANALYSIS
Robert N. Colwell, Leonard W. Bowden, and Wes Chambers, Principal Investigators *In its* An Integrated Study of Earth Resources in the State of Calif. Based on Skylab and Supporting Aircraft Data 28 Feb. 1974 4 p Prepared in cooperation with Bureau of Land Management, Riverside, Calif. EREP (For availability see N74-22018 13-13)
CSCL 08F

There are no author-identified significant results in this report.

N74-22021*# Geological Survey, Reston, Va.
INVESTIGATION OF SKYLAB IMAGERY FOR APPLICATION TO THEMATIC MAPPING Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
Doyle G. Smith, Principal Investigator 15 Apr. 1974 2 p EREP
(NASA Order T-4649-B)
(E74-10496; NASA-CR-136882) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-22022*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
[INFRARED, RADAR, AND OPTICAL APPLICATIONS OF ERTS DATA] Bimonthly Report, 1 Jan. - 28 Feb. 1974
F. C. Polcyn, F. J. Thomson, M. Leonard Bryan, I. J. Sattinger, W. A. Malila, R. F. Nalepka, C. T. Wezernak, R. Horvath, and R. K. Vincent, Principal Investigators 26 Mar. 1974 36 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Fall, S. D. 57198 ERTS
(Contract NAS5-21783)
(E74-10497; NASA-CR-136902; ERIM-193300-4-L; BMR-8) Avail: NTIS HC $5.00 CSCL 08B

There are no author-identified significant results in this report.

N74-22023*# Department of Agriculture, Washington, D.C. Statistical Reporting Service.
CROP IDENTIFICATION AND ACREAGE MEASUREMENT UTILIZING ERTS IMAGERY Progress Report, 20 Feb. - 19 Apr. 1974
Donald H. VonSteen, Principal Investigator 19 Apr. 1974 36 p ERTS

(NASA Order S-70251-AG-3)
(E74-10500; NASA-CR-136905) Avail: NTIS HC $5.00 CSCL 02C

There are no author-identified significant results in this report.

N74-22024*# California Univ., Riverside. Citrus Research Center/Agricultural Experiment Station.
EVALUATION OF REMOTE SENSING IN CONTROL OF PINK BOLLWORM IN COTTON Final Report, Jul. 1972 - Oct. 1973
Lowell N. Lewis, Principal Investigator, Virginia B. Coleman, and Claude W. Johnson 31 Mar. 1974 42 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21771)
(E74-10503; NASA-CR-136910) Avail: NTIS HC $5.25 CSCL 02C

The author has identified the following significant results. This investigation is to evaluate the use of a satellite in monitoring the cotton production regulation program of the State of California as an aid in controlling pink bollworm infestation in the southern deserts of California. Color combined images of ERTS-1 multispectral images simulating color infrared are being used for crop identification. The status of each field (crop, bare, harvested, wet, plowed) is mapped from the imagery and is then compared to ground survey information taken at the time of ERTS-1 overflights. A computer analysis has been performed to compare field and satellite data to a crop calendar. Correlation to date has been 97% for field condition. Actual crop identification varies; cotton identification is only 63% due to lack of full season coverage.

N74-22025*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STUDY OF ATMOSPHERIC EFFECTS IN SKYLAB DATA Quarterly Progress Report, 1 Dec. 1973 - 28 Feb. 1974
Frederick J. Thomson, Principal Investigator 3 May 1974 3 p EREP
(Contract NAS9-13272)
(E74-10505; NASA-CR-138091; ERIM-101700-13-L; QPR-4) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-22026*# Cornell Univ., Ithaca, N.Y.
REMOTE SENSING PROGRAM Semiannual Status Report, 1 Jun. - 30 Nov. 1973
Ta Liang 27 Dec. 1973 150 p refs
(Grant NGL-33-010-171)
(NASA-CR-138135) Avail: NTIS HC $10.50 CSCL 08F

Research projects concerning the development and application of remote sensors are discussed. Some of the research projects conducted are as follows: (1) aerial photographic inventory of natural resources, (2) detection of buried river channels, (3) delineation of interconnected waterways, (4) plant indicators of atmospheric pollution, and (5) techniques for data transfer from photographs to base maps. On-going projects involving earth resources analyses are described. Author

N74-22027# Kyoto Univ. (Japan).
CATALOGUE OF DATA IN THE WORLD DATA CENTRE C2 FOR GEOMAGNETISM, MARCH 1974
Mar. 1974 30 p
Avail: NTIS HC $4.50

A catalog of the IGY geomagnetic stations is presented. Data reported include: normal magnetograms, hourly values, rapid run magnetograms, normal tellurigrams, and rapid run tellurigrams. F.O.S.

N74-22028*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
EFFECT OF ENERGETIC ATOMIC OXYGEN AND NITROGEN ON NEUTRAL DENSITY MODELS
Ronald P. Rohrbaugh 2 Apr. 1974 65 p refs
(Grant WGL-39-009-003; Contract N00014-67-A-0385-0017)
(NASA-CR-136908; PSU-IRL-SCI-423) Avail: NTIS HC $6.25 CSCL 04A

The dissociative recombination of (Oz(+),NO(+), and N2(+) in the F-region results in the production of atomic oxygen and nitrogen with substantially greater kinetic in the production of atomic oxygen and nitrogen with substantially greater kinetic energy than the ambient atoms. A distribution technique is used to determine the amount of these energetic atoms that are capable of reaching exospheric altitudes from the collision-dominated region at which they are produced. The ballistic trajectories are then calculated in the spherical gravitational field of the earth to study their vertical and horizontal redistribution. In general, the high altitude densities are shown to be substantially greater than those predicted by diffusive equilibrium and a nighttime heating source results from the transport of the energetic atoms from the daytime to the nighttime hemisphere. However, this heating source is negligible in comparison to the major heating mechanisms of the nighttime regions. Author

N74-22029*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
ULTRAVIOLET SOURCE FOR ROCKET MEASUREMENTS OF NITRIC OXIDE IN THE UPPER ATMOSPHERE
Javed M. H. Siddiqui 3 Jan. 1974 55 p refs
(Grants NGR-39-009-218; DA-ARO(D)-31-124-72-G158)
(NASA-CR-136909; PSU-IRL-SCI-421-E) Avail: NTIS HC $5.75 CSCL 04A

An ultraviolet source suitable for balloon and rocket payloads for measurements of nitric oxide in the lower D-region of the ionosphere was developed. The source primarily emits 1236 A and 1165 A photons obtained from an R.F.-excited krypton discharge in a resonator of coaxial geometry. Ultraviolet flux output greater than 10 to the 14th power photons/sec can be obtained from this source. A systematic design philosophy is developed which enables the photon output to be optimized with respect to photon wavelength, gas pressure, R.F., resonator geometry, and gas to be used. Critical factors in the design are discussed in detail. Author

N74-22030*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
EARTH'S GRAVITY FIELD TO THE EIGHTEENTH DEGREE AND GEOCENTRIC COORDINATES FOR 104 STATIONS FROM SATELLITE AND TERRESTRIAL DATA
E. M. Gaposchkin Apr. 1973 101 p refs Prepared in cooperation with Harvard Univ., Cambridge, Mass.
(Grant NGR-09-015-002)
(NASA-CR-138160; SAO-404-065) Avail: NTIS HC $8.25 CSCL 08N

Geodetic parameters describing the earth's gravity field and the positions of satellite-tracking stations in a geocentric reference frame were computed. These parameters were estimated by means of a combination of five different types of data: routine and simultaneous satellite observations, observations of deep-space probes, measurements of terrestrial gravity, and surface-triangulation data. The combination gives better parameters than does any subset of data types. The dynamic solution used precision-reduced Baker-Nunn observations and laser range data of 25 satellites. Data from the 49-station National Oceanic and Atmospheric Administration BC-4 network, the 19-station Smithsonian Astrophysical Observatory Baker-Nunn network, and independent camera stations were employed in the geometrical solution. Data from the tracking of deep-space probes were converted to relative longitudes and distances to the earth's axis of rotation of the tracking stations. Surface-gravity data in the form of 550-km squares were derived from 19,328 1 deg X 1 deg mean gravity anomalies. Author

N74-22031*# Scientific Translation Service, Santa Barbara, Calif.
VECTOR DIAGRAM OF THE CHEMICAL COMPOSITIONS OF TEKTITES AND EARTH LAVAS
L. G. Kvasha and G. S. Gorshkov Washington NASA Dec. 1973 16 p refs Transl. into ENGLISH from Meteoritika (Moscow), v. 20, 1961 p 193-203
(Contract NASw-2483)
(NASA-TT-F-14793) Avail: NTIS HC $4.00 CSCL 08G

The chemical compositions of tektites and various volcanic glasses similar, in composition to tektites, were compared by

the petrochemical method. The advantage of this method is that a large number of chemical analyses of igneous rocks can be graphically compared with the help of vectors, plotted in relation to six parameters. These parameters, calculated from ratios of the main oxides given by silicate analysis, reflect the chief characteristics of igneous rock. Results are given in tabular form. Author

N74-22032*# Kansas Univ. Center for Research, Inc., Lawrence. Technology Applications Lab.
THE USE OF HIGH ALTITUDE AERIAL PHOTOGRAPHY TO INVENTORY WILDLIFE HABITAT IN KANSAS: AN INITIAL EVALUATION
James W. Merchant and Bruce H. Waddell (Kansas Forestry, Fish and Game Comm.) Mar. 1974 36 p refs Original contains color illustrations
(Grant NGL-17-004-024)
(TR-2230-14-1) Avail: NTIS HC $5.00 CSCL 02E

The use of aerial photography as a method for determining the wildlife conditions of an area is discussed. Color infrared photography is investigated as the most effective type of remote sensor. The characteristics of the remote sensing systems are described. Examples of the remote sensing operation and the method for reducing the data are presented. Author

N74-22033*# Auckland Univ. (New Zealand). Radio Research Centre.
INVESTIGATIONS OF THE IONOSPHERIC USING RADIO SIGNALS FROM ARTIFICIAL SATELLITES Final Report, Dec. 1959 - Nov. 1972
J. E. Titheridge Oct. 1973 24 p refs
(Grant NGR-52-001-001)
(NASA-CR-138116) Avail: NTIS HC $4.25 CSCL 04A

The occurrence and characteristics of ionospheric irregularities in medium latitudes and in polar regions were measured using radio signals from artificial satellites. Ionospheric changes during quiet and disturbed conditions were also measured. Electron density, elevation angle, and amplitude and frequency of these high frequency signals were determined as well as the direction of their arrival. E.H.W.

N74-22034*# Old Dominion Univ. Research Foundation, Norfolk, Va.
THE APPLICATION OF LASER-RAMAN LIGHT SCATTERING TO THE DETERMINATION OF SULFATE IN SEA AND ESTUARINE WATERS Final Technical Report
Alan R. Bandy Aug. 1973 65 p refs
(Grant NGR-47-003-071)
(NASA-CR-138124) Avail: NTIS HC $6.25 CSCL 08J

Laser-Raman light scattering is a technique for determining sulfate concentrations in sea and estuarine waters with apparently none of the interferences inherent in the gravimetric and titrametric methods. The Raman measurement involved the ratioing of the peak heights of an unknown sulfate concentration and a nitrate internal standard. This ratio was used to calculate the unknown sulfate concentration from a standard curve. The standard curve was derived from the Raman data on prepared nitrate-sulfate solutions. At the 99.7% confidence level, the accuracy of the Raman technique was 7 to 8.6 percent over the concentration range of the standard curve. The sulfate analyses of water samples collected at the mouth of the James River, Hampton, Virginia, demonstrated that in most cases sulfate had a constant concentration relative to salinity in this area. Author

N74-22035*# Alaska Univ., Fairbanks. Geophysical Inst.
ROCKET INVESTIGATIONS OF THE AURORAL ELECTROJET Final Report
T. Neil Davis Oct. 1973 5 p refs
(Grant NGR-02-001-080)
(NASA-CR-138111) Avail: NTIS CSCL 04A

An investigation of the mofphology of auroral electrojet currents by use of rocket-borne scalar magnetometers is discussed. Electron and proton precipitation and its effect on the auroral atmosphere through addition of particle counters and photometers to the rocket payloads and application of ground-based optical instrumentation in support of rocket flights is also discussed. There were several results: (1) Visible aurora is directly related to precipitating particle flux in a quantitative way; (2) Instability processes are operative whenever the brightness of an aurora reaches a certain level; (3) Particle acceleration by parallel electric fields near to the earth cannot be a primary mechanism causing precipitation; (4) The discovery of fast barium rays points to the existence of transient high electric fields in rayed auroras. Author

N74-22036*# Alaska Univ., Fairbanks.
MEASUREMENTS OF OPTICAL AND MIDDAY AURORAS
G. G. Sivjee Feb. 1974 43 p refs
(Grant NGR-02-001-099)
(NASA-CR-138156) Avail: NTIS HC $5.25 CSCL 04A

Measurements made in the midday auroras are analyzed and compared to measurements from the nighttime auroras. Examples are given of coordinated programs in Alaska which involve satellites, radars, ground optical instrumentation, and other types of observing satellites for the study of auroras. For individual titles, see N74-22037 through N74-22038.

N74-22037* Alaska Univ., Fairbanks. Geophysical Inst.
COORDINATED ANALYSIS OF AIRBORNE SPECTROPHOTOMETRIC MEASUREMENTS FROM THE MID-DAY AURORAS
G. G. Sivjee *In its* Mea. of Opt. and Midday Auroras Feb. 1974 p 1-18 refs (For availability see N74-22036 13-13) CSCL 04A

Measurements made in the midday auroras are analyzed and compared to measurements from the nighttime auroras. The auroral emission features in the UV spectrum, the N2(+)ING, the N22PG, and N2VK bands, are discussed. Spectral profiles of different bands are presented, and intensity distributions are obtained. Three mechanisms are suggested which can account for the marked differences between the intensity distributions of the N2(+)ING bands of the high altitude midday auroras and the low altitude nighttime auroras: (1) differences in vibrational, rotational, and transitional temperatures; (2) resonant scattering of solar radiation; and (3) excitation of slow ions. K.M.M.

N74-22038* Alaska Univ., Fairbanks. Geophysical Inst.
OPTICAL AURORA AND ITS RELATIONSHIP TO MEASUREMENTS FROM SATELLITES, VHF RADAR AND INCOHERENT SCATTER RADARS
G. J. Romick *In its* Mea. of Opt. and Midday Auroras Feb. 1974 p 17-42 refs Presented at the IAGA General Assembly, Kyoto, 10-21 Sep. 1973 (For availability see N74-22036 13-13) CSCL 04A

Examples are given of coordinated programs in Alaska which involve satellites, radars, ground optical instrumentation, and other types of observing satellites for the study of atmospheric and magnetospheric geophysics. Programs include coincidence data acquisition, scheduled data acquisition, and planned experiments. The use of optical triangulation techniques to determine the position of the aurora in order to place the other measurements in the perspective of the overall auroral morphology is detailed. K.M.M.

N74-22039# Instituto Geografico y Catastral, Madrid (Spain).
ANNUAL OF SERVICES FOR GEOMAGNETISM AND AERONOMY FOR 1971 [ANUARIOS DEL SERVICIO DE GEOMAGNETISMO Y AERONOMIA: ANO 1971]
1973 239 p In SPANISH
Avail: NTIS HC $15.00

Results are presented of the systematic measurement of the geomagnetic elements for 1971. Daily variations of the magnetic field, the activity indices for K + C, and the rapid variations are presented. Transl. by F.O.S.

N74-22040*# National Aeronautics and Space Administration, Washington, D.C.
SOME CURRENT SYSTEMS IN THE NEAR-POLAR REGION
P. V. Sumaruk and Ya. I. Feldshteyn Dec. 1973 12 p refs Transl. into ENGLISH from Acad. of Sci. USSR Preprint no. 13 (Moscow) 1973 21 pp
(NASA-TT-F-14792) Avail: NTIS HC $4.00 CSCL 08E

The existence of peculiar variations of the magnetic field in the arctic region is discussed. The space-temporal distributions of magnetic variations in the summer are presented for various

orientations of the azimuthal component of the interplanetary magnetic field in the plane of the ecliptic. Diagrams are developed to show the polar distribution of variation vectors in horizontal and vertical planes. The variations in the morning the evening and evening to morning directions of the magnetic field are emphasized. Author

N74-22041# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
CLASSIFIED LISTING OF IONOSPHERE RESEARCH LABORATORY SCIENTIFIC REPORTS
R. Divany and G. Spinelli 1 Mar. 1974 87 p
(PSU-IRL-SCI-400) Avail: NTIS HC $7.50

An index of reports on ionospheric research are presented. The reports are categorized according to subject in groups such as: (1) terrestrial space, (2) interplanetary space, and (3) wave propagation. The sections of the report consist of listings by numerical order, author, and subject. Author

N74-22042*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
RADIATION CHARACTERISTICS OF THE ATMOSPHERE AND THE EARTH'S SURFACE
K. Ya. Kondratev, ed. 1973 597 p refs Transl. into ENGLISH of the book "Radiatsionnye Kharakteristiki Atmosfery i Zemnoi Poverkhnosti" Leningrad, Gidrometeorologicheskoe Press, 1969 p 1-580 Sponsored by NASA and NSF
(NASA-TT-F-678; TT-58003) Avail: NTIS HC $11.00 CSCL 04A

Information is presented on the most important features of atmospheric radiation such as the quantitative characteristics of molecular absorption and scattering, spectral and angular distributions, and the three-dimensional structure of shortwave and longwave radiation fields. The model of the structure and composition of the atmosphere is described, and the fundamental optical characteristics of absorption and scattering of radiation by the atmosphere are examined. The principles are studied of the variability of direct solar, scattered, reflected and total radiation. Author

N74-22043# National Bureau of Standards, Washington, D.C. Physical Chemistry Div.
CHEMICAL KINETICS DATA SURVEY. 7: TABLES OF RATE AND PHOTOCHEMICAL DATA FOR MODELLING OF THE STRATOSPHERE (REVISED)
David Garvin, ed. and R. F. Hampson, ed. Jan. 1974 104 p refs Supersedes NBSIR-73-203 Sponsored by DOT
(NBSIR-74-430; NBSIR-73-203) Avail: NTIS HC $8.25

Chemical kinetic and photochemical data for gas phase reactions pertinent to the chemistry of the stratosphere are presented in four tables. These tables give recommended values and also cite recent experimental work. They give data in the following subject areas: chemical reactions and photochemistry of neutral species; energy transfer reactions; high temperature air reactions; and ion-molecule reactions. Author

N74-22044# Instituto Geografico y Catastral, Madrid (Spain). Seccion de Geomagnetismo y Aeronomia.
CONTRIBUTION TO THE STUDY OF THE MAGNETIC STORMS FOR 15 MAY AND 17 JUNE, 1972 [CONTRIBUCION AL ESTUDIO DE LAS TORMENTAS MAGNETICAS DE LOS DIAS, 15 MAYO Y 17 DE JUNIO DE 1972]
Fernando Aranaz Y. DelRio 1973 56 p refs In SPANISH
Avail: NTIS HC $6.00

The observations of magnetic storms of 15 and 17 June 1972 are analyzed based on the data for the Lograno, Toledo, Almeria, and Santa Cruz de Tenerife observatories. The horizontal and vertical components, declination, sunspots, solar flux, satellite observations, and cosmic radiation are included.
Transl. by F.O.S.

N74-22045*# Scientific Translation Service, Santa Barbara, Calif.
RADIATION TEMPERATURES OF THE EARTH'S MANTLE IN THE SUPERHIGH FREQUENCY AND INFRARED REGIONS BASED ON DATA FROM AN EXPERIMENT ON THE ARTIFICIAL EARTH SATELLITE COSMOS-384
A. Ye. Basharinov, A. K. Gorodetskiy, A. S. Gurvich, S. T. Yegorov, A. A. Kurskaya, D. T. Matveyev, A. P. Orlov, and A. M. Shutko Washington NASA Jul. 1973 11 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Atmos. Okeana (USSR), vol. 9, no. 2, 1973 p 183-186
(Contract NASw-2483)
(NASA-TT-F-14734) Avail: NTIS HC $4.00 CSCL 08E

Radiation experiments carried out by Cosmos 284 are reported. The following were determined for the Antarctic region: radio brightness temperature, infrared radiation temperatures, and ice distribution. Observations of Africa are also described.
Author

N74-22046*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
OPTICAL MODELING OF AGRICULTURAL FIELDS AND ROUGH-TEXTURED ROCK AND MINERAL SURFACES
G. H. Suits, R. K. Vincent, H. M. Horwitz, and J. D. Erickson Nov. 1973 46 p refs
(Contract NAS9-9784)
(NASA-CR-134243; ERIM-31650-78-T) Avail: NTIS HC $5.50 CSCL 02C

Review was made of past models for describing the reflectance and/or emittance properties of agricultural/forestry and geological targets in an effort to select the best theoretical models. An extension of the six parameter Allen-Gayle-Richardson model was chosen as the agricultural plant canopy model. The model is used to predict the bidirectional reflectance of a field crop from known laboratory spectra of crop components and approximate plant geometry. The selected geological model is based on Mie theory and radiative transfer equations, and will assess the effect of textural variations of the spectral emittance of natural rock surfaces. Author

N74-22047*# Kansas Univ. Center for Research, Inc., Lawrence. Space Technology Center.
RESEARCH ON THE APPLICATION OF SATELLITE REMOTE SENSING TO LOCAL, STATE, REGIONAL AND NATIONAL PROGRAMS INVOLVED WITH RESOURCE MANAGEMENT AND ENVIRONMENTAL QUALITY Annual Report, 1 Apr. 1972 - 30 Mar. 1974
B. G. Barr Apr. 1974 98 p
(Grant NGL-17-004-024)
(NASA-CR-138173) Avail: NTIS HC $8.00 CSCL 08B

A program designed to involve state, regional and local agency personnel in the application of remote sensing is reported. During this period fifteen applications projects were initiated in support of twenty-five separate state, county and municipal agencies or entities. Eight of the projects were completed with positive results which aided the agencies involved. These results included information which contributed to decisions on: (1) selection of a route for a scenic parkway, (2) policy development on open land use, (3) policy related to urban development, (4) a major reservoir project by a governor's staff, (5) control tactics and damage assessment during flooding conditions on the Kansas and Missouri rivers, and (6) initiating a program of habitat inventory by remote sensing by the Kansas Forestry, Fish and Game Commission. Author

N74-22048*# Scientific Translation Service, Santa Barbara, Calif.
THE ASSOCIATION OF CERTAIN PROPERTIES OF RELIEF OF SOUTHEAST FERGAN WITH FRACTURING
N. G. Utkina Washington NASA Sep. 1973 13 p refs Transl. into ENGLISH from the book "Materialy po Geologii Kaynozoya i Noveyshey Tektonike Tyan-shanya" Ilim Press, Frunze, 1970 p 172-181
(Contract NASw-2483)
(NASA-TT-F-14753) Avail: NTIS HC $4.00 CSCL 08E

The linear features of the relief in the Fergan depression are studied to determine their relationship to the orientation of fracturing. More than 300 measurements of the directions of ravines and their tributaries in the Zhigula region were made. It is concluded that there is still insufficient material to reach any conclusions on the development of fracturing. Author

N74-22049*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
IMPROVEMENTS IN ESTIMATING PROPORTIONS OF

OBJECTS FROM MULTISPECTRAL DATA Technical Report, 1 Feb. 1973 - 31 Jan. 1974
H. M. Horwitz, P. D. Hyde, and W. Richardson Apr. 1974 76 p refs
(Contract NAS9-9784)
(NASA-CR-134252; ERIM-190100-25-T) Avail: NTIS HC $7.00 CSCL 05B

Methods for estimating proportions of objects and materials imaged within the instantaneous field of view of a multispectral sensor were developed further. Improvements in the basic proportion estimation algorithm were devised as well as improved alien object detection procedures. Also, a simplified signature set analysis scheme was introduced for determining the adequacy of signature set geometry for satisfactory proportion estimation. Averaging procedures used in conjunction with the mixtures algorithm were examined theoretically and applied to artificially generated multispectral data. A computationally simpler estimator was considered and found unsatisfactory. Experiments conducted to find a suitable procedure for setting the alien object threshold yielded little definitive result. Mixtures procedures were used on a limited amount of ERTS data to estimate wheat proportion in selected areas. Results were unsatisfactory, partly because of the ill-conditioned nature of the pure signature set. Author

N74-22050*# Environmental Research Inst. of Michigan, Ann Arbor.
WHEAT CLASSIFICATION EXERCISE, USING 11 JUNE 1973, ERTS MSS DATA FOR FAYETTE COUNTY, ILLINOIS (FOR CITARS TASK)
William A. Malila, Ross H. Hieber, Daniel P. Rice, and Jane E. Sarno 26 Sep. 1973 20 p refs
(Contract NAS9-9784)
(NASA-CR-134253; TM-190100-21-R) Avail: NTIS HC $4.00 CSCL 02C

The prime emphasis was on classification of pixels in field centers, away from boundary effects. Results were encouraging in both training and test field centers for wheat and other major types of vegetation present. However, the location of fields was found to be a serious problem and it was even more difficult to select field-center pixels for fields of sizes less than 20 acres (or even larger, depending upon field shape) for use in the field-center analysis. The majority of fields in the segment are less than 20 acres in size. ERTS-1 data were received on 12 September 1973. Ground truth information and aerial photography were received on 9 and 15 September. The data were analyzed and processed digitally using the ERIM multispectral software system. Author

N74-22051*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Oprics Div.
THE NASA EARTH RESOURCES SPECTRAL INFORMATION SYSTEM: A DATA COMPILATION, SECOND SUPPLEMENT
R. K. Vincent Apr. 1973 140 p refs
(Contract NAS9-9784)
(NASA-CR-134267; ERIM-31650-156-T) Avail: NTIS HC $10.00 CSCL 05B

The NASA Earth Resources Spectral Information System (ERSIS) and the information contained therein are described. It is intended for use as a second supplement to the NASA Earth Resources Spectral Information System: A Data Compilation, NASA CR-31650-24-T, May 1971. The current supplement includes approximately 100 rock and mineral, and 375 vegetation directional reflectance spectral curves in the optical region from 0.2 to 22.0 microns. The data were categorized by subject and each curve plotted on a single graph. Each graph is fully titled to indicate curve source and indexed by subject to facilitate user retrieval from ERSIS magnetic tape records. Author

N74-22052# Massachusetts Univ., Boston.
GRAVITATIONAL FIELD OF A FREELY MOVING MASS
Freda Salzman 9 Jan. 1974 51 p Submitted for publication
Avail: NTIS HC $5.75

A definition of a freely moving mass in general relativity is proposed based upon properties of the analogous motion in special relativity. Coordinate ambiguities can, to a large extent, be removed with the use of invariant quantities which play the role of gauge invariants in general relativity under coordinate transformations which do not change the frame of reference. The gravitational force which a freely moving source, taken to be a Schwarzschild mass, exerts on a test mass momentarily at rest, or on another mass momentarily at rest asymptotically far away is calculated, showing that two body effects can be important even in the case of a test mass. The definition of a freely moving mass is shown to be physically meaningful to terms of second order. The calculation has close similarities to that for the analogous motion of a freely moving charge in electrodynamics, reinforcing the idea that a restricted set of coordinate transformations in general relativity corresponds to the gauge transformations of electrodynamics in special relativity. Author

N74-22053*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
QUALITY OF SIGNATURES Final Report
Edwin P. F. Kan Apr. 1974 18 p
(Contract NAS9-12200)
(NASA-CR-134263; LEC-3175) Avail: NTIS HC $4.00 CSCL 05B

Three conclusions are drawn on the usability, inherent variations, and noise aspects of the spectral signatures processed from data collected by the Field Signature Acquisition System (FSAS). Conclusions are based on the spectral data collected from winter wheat of the 1972/73 season, grown at Texas A and M University, College Station, Texas. Author

N74-22054# Lockheed Missiles and Space Co., Palo Alto, Calif.
INVESTIGATION OF THE BANDWITH OF AN INHOMOGENEOUS IONOSPHERE CONFIGURATION FROM OBSERVATION DATA ON THE 'KOSMOS-381'
Ia. L. Alpert and L. N. Vitshas [1973] 5 p Transl. into ENGLISH from Kosm. Issled. (USSR), vol. 11, no. 6, 1973 p 890-896
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Dependences of the bandwidth of an inhomogeneous ionosphere configuration, the fluctuations, and their relative values on the linear dimensions of inhomogeneous formations are determined from the results of radio observations of the difference in the Doppler frequency shift of coherent radiowaves emitted by the Maiak from the Kosmos-381. Data obtained earlier by using the Elektron-1 and Elektron-3 are used for comparison. The range of the values considered separates into three bands. Statistical averages are determined for each band. The results obtained characterize the space factor of the outer ionosphere at 900 - 1100 km altitudes, as well as in the region of altitudes 400 - 2300 km, by inhomogeneities of different size, and the variability of the quantity, due to fluctuations in the electron concentration. Author

N74-22055# Lockheed Missiles and Space Co., Palo Alto, Calif.
INTERPLANETARY MAGNETIC FIELD, RECONNECTION AND STRUCTURE OF MAGNETOSPHERIC STORMS
K. G. Ivanov and N. V. Mikerina [1973] 5 p refs Transl. into ENGLISH from Geomagn. Aeron. (USSR), v. 13, no. 5, 1973 p 891-895
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The normal interplanetary magnetic field component and the rate of reconnection are compared with the perturbation field in the domain of the western electrojet. The conception of a storm as a sequence of substorms is confirmed. It is shown that in agreement with the discontinuous reconnection scheme, the rate of reconnection growth diminishes the intervals between substorms substantially and qualitatively alters the substorm shape. Author

N74-22056*# City Coll. of the City of New York.
INVESTIGATION OF THE RESPONSES OF THE GENERAL CIRCULATION AT 700 MB TO SOLAR-GEOMAGNETIC DISTURBANCE
Harold L. Stolov and Ralph Shapiro (AFCRL, Bedford, Mass.) [1973] 35 p refs Sponsored by NASA
(NASA-CR-138184) Avail: NTIS HC $5.00 CSCL 04A

The Northern Hemisphere 700 mb contour heights from 20 N to 70 N for the period 1947-1970 are studied in conjunction

with 272 key days, where the daily increase of the Ci index equals or exceeds 1.0. The superposed epoch method is applied from 33 days before to 66 days after the key day for a variety of zonal and meridional indices. It is shown that the 700 mb height difference between 20 N and 55 N increases significantly in winter 4 days following geomagnetic disturbance (in summer a less prominent but statistically significant increase is found 2 days earlier). The effect is most clear in winter in the quadrant 90-175 W and corresponds to a 7% increase in the mean geostrophic westerly flow. The statistical significance of the results is established by applying Student's t-test to the difference of each daily mean from the continuum. Author

N74-22057*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONTRIBUTIONS OF SATELLITE-DETERMINED GRAVITY RESULTS IN GEODESY
Mohammmad Asadullah Khan Feb. 1974 28 p refs Submitted for publication
(NASA-TM-X-70634; X-921-74-54) Avail: NTIS HC $4.50 CSCL 08E

Different forms of the theoretical gravity formula are summarized and methods of standardization of gravity anomalies obtained from satellite gravity and terrestrial gravity data are discussed in the context of three most commonly used reference figures, e.g., International Reference Ellipsoid, Reference Ellipsoid 1967, and Equilibrium Reference Ellipsoid. These methods are important in the comparison and combination of satellite gravity and gravimetric data as well as the integration of surface gravity data, collected with different objectives, in a single reference system. For ready reference, tables for such reductions are computed. Nature of the satellite gravity anomalies is examined to aid the geophysical and geodetic interpretation of these anomalies in terms of the tectonic features of the earth and the structure of the earth's crust and mantle. Computation of the Potsdam correction from satellite-determined geopotential is reviewed. The contribution of the satellite gravity results in decomposing the total observed gravity anomaly into components of geophysical interest is discussed. Recent work on the possible temporal variations in the geogravity field is briefly reviewed. Author

N74-22058*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATEGIES FOR ESTIMATING THE MARINE GEOID FROM ALTIMETER DATA
P. Argentiero, W. D. Kahn, and R. Garza-Robles Apr. 1974 36 p refs Presented at the Natl. Spring Meeting of the Am. Geophys. Union, Washington, D. C., 8-12 Apr. 1974 Submitted for publication
(NASA-TM-X-70637; X-932-74-90) Avail: NTIS HC $5.00 CSCL 08E

In processing altimeter data from a spacecraft borne altimeter to estimate the fine structure of the marine geoid, a problem is encountered. In order to describe the geoid fine structure, a large number of parameters must be employed and it is not possible to simultaneously estimate all of them. Unless the parameterization exhibits good orthogonality in the data, serious aliasing results. From simulation studies it has been found that amongst several competing parameterizations, the mean free air gravity anomaly model (i.e., Stokes' formula) exhibited promising geoid recovery characteristics. Using covariance analysis techniques, this report provides quantitative measures of the orthogonality properties associated with the above mentioned parameterization. It has been determined that a 5 deg x 5 deg area mean free air gravity anomaly can be estimated with an uncertainty of 1 mgal (40 cm undulation) provided that all free air gravity anomalies within a spherical radius of 10 arc degrees are simultaneously estimated. Author

N74-22059*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ESTIMATION OF SUNLIGHT PENETRATION IN THE SEA FOR REMOTE SENSING
W. R. McCluney Apr. 1974 31 p refs
(NASA-TM-X-70643; X-913-74-113) Avail: NTIS HC $4.75 CSCL 08J

There is a need for a simple theoretical approach to the calculation of sunlight penetration depths suitable for passive multispectral remote sensing of water resources. An earlier paper presented an approach which is readily adapted to this calculation and which provides reasonably good agreement with more accurate but time-consuming radiative transfer models. The needed modifications are described and the model is used to calculate the penetration of sunlight into clear ocean water at several wavelengths throughout the visible portion of the spectrum. Calculations for both clear and turbid water are carried out for the two visible channels of the multispectral scanner on NASA's ERTS-1 satellite. The effect of a reflective bottom on the upwelling light field is discussed. Measurement parameters needed for the passive remote determination of water depths are identified and the use of submerged reflective panels for surface truth measurements is discussed. Author

N74-22060# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.
HYDROTHERMS AND SUPERHEAVY ELEMENTS
Yu. T. Chuburkov and L. M. Lebedev 1973 16 p refs In RUSSIAN
(JINR-P13-7249) Avail: AEC Depository Libraries HC $3.00

The most perspective region for the search of super heavy elements in the U.S.S.R. is the Caspian Sea, in particular, the hydro-thermal ore-bearing system is Cheleken. The hydrotherms in California (Salton Sea region), in the Red Sea (Atlantis 2 and Discovery), and in New Zealand were analyzed from the above point of view. Author (NSA)

N74-22061# Telespazio, S.p.A., Rome (Italy).
DESIGN STUDY FOR THE ERAF DATA PROCESSING FACILITY
G. Bressanin, F. Capozza, L. A. CiavoliCortello, J. Erickson, L. Fusco, A. Marconi, B. Ratti, and C. Valzecchi Nov. 1973 128 p refs
(Contract ESTEC-1761/72-PP)
(ESRO-CR(P)-352) Avail: NTIS HC $9.50

The most significant preprocessing requirements for data gathered by European Earth Resources Aircraft Facility (ERAF) are examined. The data processing facilities required to accept ERAF generated data and transform the images and tapes into formats acceptable to the earth scientists are discussed. ESRO

N74-22062# Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS Quarterly Report, 1970 [OBSERVATIONS D'OZONE 1ER TRIMESTRE 1970]
1974 56 p refs In FRENCH and DUTCH
(QR-1) Avail: NTIS HC $6.00

Spectrophotometric ozone measurements are reported for the first quarter of 1970. The presented ozonograms contain designations for partial ozone pressure and atmospheric diffusion, air temperature, and used wavelengths. ESRO

N74-22063# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Sep. 1973 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, SEPTEMBRE 1973]
Sep. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $4.75

Results of ionospheric and cosmic ray (neutron component) observation at Dourbes (Belgium) are tabulated for September 1973. ESRO

N74-22064# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Oct. 1973 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, OCTOBRE 1973]
Oct. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $4.75

Results of ionospheric and cosmic ray (neutron component) observations at Sourbes (Belgium) are tabulated for October 1973. ESRO

N74-22065# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Nov. 1973 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, NOVEMBRE 1973]
Nov. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $4.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabultated for November 1973. ESRO

N74-22066# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Sep. 1973 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, SEPTEMBRE 1973]
Sep. 1973 26 p In FRENCH and DUTCH
Avail: NTIS HC $4.50

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during September 1973 are presented. ESRO

N74-22067# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Oct. 1973 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, OCTOBRE 1973]
Oct. 1973 26 p In FRENCH and DUTCH
Avail: NTIS HC $4.50

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during October 1973 are presented. ESRO

N74-22068# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany). Inst. fuer Meteorologie und Geophysik.
TEST OF A METHOD FOR MEASURING AMMONIUM AND AMMONIA IN THE ppb RANGE [ERPROBUNG EINES VERFAHRENS ZUR MESSUNG VON AMMONIUM UND AMMONIAK IM ppb-BEREICH]
H. W. Georgii, D. Jost, and W. J. Mueller May 1973 29 p refs In GERMAN; ENGLISH summary
(Rept-25) Avail: NTIS HC $4.50

With the help of an automatic analyzer, the Indophenol blue reaction can be used to analyze samples of atmospheric air in a shorter sample time. When sample solutions contain concentrations of SO2 in the region of 500 microg/ml and concentrations of H2S in the region of 1 microg/ml, only a small interference is found. One essential difference between the standard method of analysis used until now (Nessler's Analysis) and the Indophenol blue method lies in the improvement of the reagens stability. The great absorption speed of the absorption solution 0.01n H2SO4 for ammonia and equipment Georgii leads to practically complete absorption. To measure the ammonium aerosols a Sartorius-PVC-membrane filter of pore size 0.45 micron was placed in front of the wash flask. Author (ESRO)

N74-22069# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany). Inst. fuer Meteorologie und Geophysik.
OPERATIONAL TEST AND POSSIBLE APPLICATIONS OF A CONTINUOUS MEASURING SYSTEM FOR NITROUS GASES IN THE ppb RANGE [FUNKTIONSPRUEFUNG UND EINSATZMOEGLICHKEITEN EINES KONTINUIERLICHEN MESSSYSTEMS FUER NITROSE GASE IM ppB-BEREICH]
H. W. Georgii, W. Grosch, and D. Jost Aug. 1973 109 p refs In GERMAN; ENGLISH summary Sponsored by Deut. Forschungsgemeinschaft
(Rept-26) Avail: NTIS HC $8.50

When using mobile measuring equipment to detect trace gases in the atmosphere sensitive continuous monitors, which are lightweight, battery driven and simple in use, are necessary. An amperometrical method for measuring nitrogen oxides in the ppb range was tested for disturbing parameters. The system is calibrated by relation to Saltzman method. The oxidation of NO is the most important problem. The rate of oxidation is a function of the humidity of the measured gas. When changing the environmental temperature of the instrument, thermovoltage could disturb measurement. The pressure influence on the system can be eliminated by theoretical calculation. The time constants of the system are dependent on the concentration level. The maximum range of scale can be changed within a ratio 1:100. The high sensivity of about 100 ppb f.s. permits measurements at background level, but the high time constant at these levels allows usage in air only under special conditions.
Author (ESRO)

N74-22070# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Extraterrestrische Sensortechnik.
STUDY FOR A GEOSCIENTIFIC AIRCRAFT MEASUREMENT PROGRAM [STUDIE FUER EIN ERDWISSENSCHAFTLICHES FLUGZEUG-MESSPROGRAMM]
A. Rossbach and M. Schroeder Feb. 1973 125 p In GERMAN
Avail: NTIS HC $9.25

A German program for geoscientific aircraft measurements, including oceanography, geophysics, water pollution, sediment transport, meteorology, vegetation and ecology, is proposed. The scientific program and the areas to be surveyed are discussed. The choice of remote sensors and the requirements for processing the data measured are considered. The choice of the measuring aircraft and the flight plans are explained. Remote sensing projects in other European countries are discussed briefly, and project management considerations are given. ESRO

N74-22071# Bonn Univ. (West Germany). Inst. fuer Physik.
ATOMIC AND MOLECULAR OXYGEN IN THE LOWER THERMOSPHERE [ATOMARER UND MOLEKULARER SAUERSTOFF IN DER UNTEREN THERMOSPHAERE]
Dirk Offermann Bonn Bundesmin. fuer Forsch. und Technol. Nov. 1973 152 p refs In GERMAN; ENGLISH summary
Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FBW-73-19) Avail: NTIS

Several measuring techniques for the determination of atomic and molecular oxygen densities in the altitude region from 85 to 150 km are discussed. Results obtained by these methods are correlated to such geophysical parameters as season, local time, and geomagnetic activity. The maximum of the atomic oxygen layer below 100 km shows only small density variations. Absolute densities and density variations of O and O2 are compared to a number of atmospheric models. ESRO

N74-22072# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PASSAGE OF AN ELECTRON STREAM THROUGH THE ATMOSPHERE
N. K. Osipov, N. B. Pivovarova, V. G. Pivarov, and L. F. Timoshenko 30 Jan. 1974 21 p refs Transl. into ENGLISH from Issled. Geomagnetizum, Aeronomii Fiz. Solntsa. Zemnoi Magnetism (USSR), v. 5, 1969 p 107-116
(AD-774406; FTD-HT-23-862-73) Avail: NTIS CSCL 04/1

The paper gives the results of the calculation of the interaction of the electron streams with the atmosphere, obtained with the help of an electronic computer. The effect of the altitudinal change of the recombination coefficient on the characteristics of the electron concentration profile was studied. Author (GRA)

N74-22073# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
GRAVIMETRIC INVESTIGATIONS IN THE REGION OF THE SOVIET ANTARCTIC STATIONS
A. L. Kogan and P. A. Stroev Jan. 1974 11 p refs Transl. into ENGLISH from Tr. Moscow Univ. Gos. Astron. Inst. (Moscow), v. 43, no. 2, 1972 p 3-7
(AD-773912; DMAAC-TC-1991) Avail: NTIS CSCL 08/5

A description of all the gravimetric investigations in the region of Princess Astrid Coast is presented. These are land and marine surveys carried out from 1959 to 1964. These works were continued in 1969 by the XIV Soviet Antarctic Expedition. On the continental glacier, within the general complex of geophysical investigations, gravity measurements were carried out at 41 points. A catalog of these points is presented. Author (GRA)

N74-22074# Tetra Tech, Inc., Arlington, Va.
ULTRA-DEEP DRILLING FOR GEOTHERMALS Final Report
Samuel O. Patterson, Bruno E. Sables, and Anthony Kooharian Dec. 1973 144 p refs
(Contract NOd-9925; ARPA Order 2419)
(AD-774108; TETRAT-A-74-339-005) Avail: NTIS CSCL 08/9

Geothermal energy offers significant promise as a source of clean, widely available power. The first stage of its availability involves near surface sources; the second, abnormal thermal gradients; and the third stage, deep wells. This report assesses the potential and limitations of rotary drilling for deep geothermal systems. The assessment found that hot, dry rock geothermal energy produced from wells in the 35-40,000-ft range offers good potential to provide clean energy, a self-contained or independent energy source, no resupply for special problem maintenance systems, and the promise of economic competitiveness up to 100 Mw. Author (GRA)

N74-22075# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.
RE-ENTRY PHYSICS Final Report, Nov. 69 - Dec. 72
John P. Appleton and James A. Fray Dec. 1973 11 p refs
(Contract N00014-67-A-0204-0040; NR Proj. 061-141)
(AD-773954) Avail: NTIS CSCL 07/4

The modified phase space theory of reaction rates and Monte Carlo trajectory calculations were applied to the problem of three-body recombination and dissociation of diatomic molecules. On the basis of comparisons made between the phase space theory predictions of the rate coefficients and experimental measurements it is concluded that the phase space theory is capable of yielding good a priore estimates of three-body rate coefficients over a wide temperature range. Exploratory experiments were carried out in a stratified-flow wind tunnel in an attempt to measure the growth of momentumless wake in a stratified flow. (Modified author abstract) GRA

N74-22076# Naval Oceanographic Office, Washington, D.C.
THE INFLUENCE OF HYDROMETEOROLOGICAL CONDITIONS ON COMMERCIAL CONCENTRATIONS OF WHALES IN THE ANTARCTIC
Yu. P. Zavernin Nov. 1973 23 p refs Transl. into ENGLISH from Izv. Tikhookean. Nauch. Inst. Ryb. Khoz. Okeanogr. (Moscow), v. 58, 1966 p 209-220
(AD-772793; NOO-Trans-566) Avail: NTIS CSCL 06/3

Accurate prediction of whale concentration areas can enhance commercial whaling efforts. In the Antarctic, baleen whales concentrate at feeding grounds where there is an abundance of zooplankton (euphausiids). Cyclonic circulation in the atmosphere determines corresponding circulation in the hydrosphere. The result is the upwelling of warm deep waters rich in zooplankton. Wind direction is also a factor in predicting whale movements. Whales move against the wind, and the predominance of any wind component in the Antarctic serves as an indicator of whale migration. (Modified author abstract) GRA

N74-22077# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
QUANTIFICATION OF SHORELINE MEANDERING
Linwood Vincent Nov. 1973 92 p refs
(Contract N00014-69-A-0060-0006; NR Proj. 389-158)
(AD-773050; TR-7) Avail: NTIS CSCL 08/7

Rhythmic, shoreline topography, termed shoreline meandering was investigated along Hatteras Island, North Carolina, using historical aerial photography. Two types of meanders were distinguished on the basis of form geometry. The temporal and spatial variability of meandering along the island were quantified using spectral and multivariate techniques. The data suggested that a model of the beach cycle in the nearshore zone in which the occurrence of small meanders is a function of (1) storm-current velocity and nearshore slope and (2) a post-storm balance of onshore and offshore sand transport due to the presence of topography-forced nearshore circulation explains the observed characteristics of small, rhythmic meanders. Large meanders are explained as regions of severe storm erosion caused by wave convergence over long, offshore shoals. Author (GRA)

N74-22078# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ANALYSIS OF THE EFFECTIVENESS OF ELECTROSTATIC SHIELDING IN AN ABSOLUTE GRAVIMETER
M. G. Smirnov 11 Dec. 1973 8 p refs Transl. into ENGLISH of the Mono. "Izmerenie Absolyuntnogo Znacheniya Gravitatsionnogo Uskoreniya, Novosibirsk" (USSR), 1972 p 61-64
(AD-773497; FTD-HT-23-769-74) Avail: NTIS CSCL 08/5

A preliminary analysis and experiments have shown that electrostatic forces cause a considerable (up to several tens of milligals) error of an absolute gravimeter. Therefore, in the design of a gravimeter the electrostatic shielding of its internal cavity was envisioned. Author

N74-22079# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ON THE QUESTION OF ISOSTASY OF THE OKHOTSK REGION
A. A. Andreev Nov. 1973 13 p refs Transl. into ENGLISH from Geol. Geofiz. (USSR), no. 8, 1973 p 108-112
(AD-773853; DMAAC-TC-1984) Avail: NTIS CSCL 08/7

The basic result of studies of isostatic conditions in the Okhotsk region is the establishment of the fact that conditions close to equilibrium exist in the water areas of the Sea of Okhotsk. As a consequence, the isostatic state of the Okhotsk region was studied on the basis of an analysis of the isostatic anomalies and of the approximate overcompensation coefficients, and also by estimating the vertical pressure in the mantle along deep seismic sounding profiles. In this article a method is given for the study of isostasy, which differs from all other preceeding methods. Author (GRA)

N74-22080# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
THE DYNAMICS OF BOTTOM BOUNDARY CURRENTS IN THE OCEAN Ph.D. Thesis
Peter C. Smith Oct. 1973 215 p refs
(Contract N00014-67-A-0204-0048; Grant NSF GA-30616; NR Proj. 083-157)
(AD-773619; Rept-73-4; GFD-73-5) Avail: NTIS CSCL 08/3

The report presents an investigation of the dynamics of bottom boundary currents in the ocean. The major emphasis is to develop simple mathematical models in which various dynamical features of these complex geophysical flows may be isolated and explored. Two separate models are formulated and the theoretical results are compared to observational data and/or laboratory experiments. A steady flow over a constant sloping bottom is treated in each model. (Modified author abstract) GRA

N74-22081# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ELECTRON TRANSPORT IN A DILUTE WEAKLY IONIZED GAS APPLICATION TO A MODEL IONOSPHERE Environmental Research Papers
John R. Jasperse 27 Sep. 1973 54 p refs
(AF Proj. 8627)
(AD-775088; AFCRL-TR-73-0600; AFCRL-ERP-456) Avail: NTIS CSCL 04/1

The author presents a kinetic model for the electron distribution function in micro-space in a dilute, nonuniform, weakly ionized gas. The model includes photoproduction of electron-ion pairs, electron-ion recombination, and elastic, inelastic, and ionizing electron-neutral collisions. Under special conditions exact solutions are found for the steady-state electron velocity spectrum in a uniform, infinite medium for a delta-function photon energy source, and for an exponentially decreasing photon energy source. Also presented is a general method for finding the electron distribution function in a plane-parallel medium where the neutral gas density varies exponentially with position. The method is applied to give an approximation to the electron-ion concentration, the electron-ion drift velocity, and the electron temperature for a model ionosphere at altitudes where the assumption of weak ionization is valid. Author (GRA)

N74-22082# Aerospace Corp., El Segundo, Calif. Lab. Operations.
GEOMAGNETICALLY TRAPPED ALPHA PARTICLES: LOW-ALTITUDE OUTER ZONE ALPHA-PROTON COMPAR-

ISONS Report for Nov. 1972 - Apr. 1973
Joseph F. Fennell, J. Bernard Blake, and George A. Paulikas
15 Jan. 1974 41 p refs
(Contract F04701-73-C-0074)
(AD-775168; TR-0074(4260-20)-B; SAMSO-TR-74-24) Avail: NTIS CSCL 04/1

The outer-zone population of trapped alpha particles and protons was measured off the equator (B/Bo = 1.3-2.3) in the L interval 2 = or < L = or < 4 during 1969. The alpha-particle spectra are best represented by a power law with spectral indices between 2.4 and 4.0 over the energy range 0.85 = or < (E sub alpha) = or < 9.0 MeV. The alpha-particle and proton spectra have the same slope at the same total energy. The distribution functions for alpha particles and protons have similar shapes and they suggest that the location of the source of these particles is at L > 4. The proton pitch-angle distribution at small pitch angles is flatter than near the equator. It is suggested that pitch-angle scattering may be the primary source of the low-altitude ions. The measurements are compared with recent theoretical predictions. (Modified author abstract) GRA

N74-22083# Northeastern Univ., Boston, Mass.
CERTAIN FINITE DIFFERENCE METHODS FOR THE SOLUTION OF LARGE SCALE CIRCULATION PROBLEM 2 Final Report, 1 Dec. 1971 - 30 Jun. 1973
Robert D. Klein, Jack C. Mettauer, Vito P. Maglione, and Stanley L. Spiegel 8 Nov. 1973 239 p refs
(Contract F19628-72-C-0009; AF Proj. 8604)
(AD-775076; AFCRL-TR-73-0640) Avail: NTIS CSCL 04/1

A program description for a large scale multi-level general circulation model of the atmosphere is presented. Several time integration scheme algorithms are discussed, and a linear stability analysis of finite difference approximation to a meteorological equation of motion is given. In addition, experiments involving the numerical solution of the non-divergent barotropic general circulation problem, using overlapping grid systems, are described and evaluated. Problems involving the numerical solution, via relaxation, of Poisson's equation on the sphere, and the evaluation of finite difference derivations of interpolated quantities are discussed. Author (GRA)

N74-22084# Avco-Everett Research Lab., Everett, Mass.
LASER ATMOSPHERIC PROPAGATION KINETICS Semiannual Technical Report
C. A. Brau Jan. 1974 31 p refs
(Contract N00014-73-C-0311; ARPA Order 1806)
(AD-775260) Avail: NTIS CSCL 04/1

An analytical model has been developed describing the atmospheric absorption of DF laser energy and the subsequent kinetic processes of energy exchange. For eight representative strong laser transitions, the atmospheric absorbers with energy levels and absorption cross sections have been specified. The analytical kinetic model describing the kinetics of absorption by N2O, CO2, CH4, and HDO -H2O has been developed and rate constants have been selected for use in the calculation. Preliminary results of the quantitative determination of the atmospheric temperature change resulting from absorption by N2O are presented. An assessment of the sea level kinetic effects of N2O in heating the atmosphere is given using a simple square wave pulse shape. Two limiting concentrations of water have been used and the laser energy has been varied over several orders of magnitude. Author (GRA)

N74-22085# California Univ., Riverside. Dept. of Geography.
CORRELATION OF REMOTE SENSING IMAGERY OF THE COAST OF SOUTHERN AND BAJA CALIFORNIA WITH TERRAIN ANALYSIS Final Report
Leonard W. Bowden Oct. 1973 62 p refs
(Contract N00014-69-A-0200-5003; NR Proj. 387-045)
(AD-773598; TR-0-73-3) Avail: NTIS CSCL 08/6

The research emphasizes the use and application of remote sensing techniques to coastal environment research of Baja and southern California. Ten technical reports, and numerous professional papers resulted, ranging over topics such as coastal vegetation, landforms, and use, tectonics and human activities. The research topics are summarized in an informal style and described in chronological order. (Modified author abstract) GRA

N74-22086# New Mexico Inst. of Mining and Technology, Socorro.
AUGMENTED RESEARCH AND GRADUATE EDUCATION IN THE ENVIRONMENTAL SCIENCES Final Technical Report, 1 Sep. 1967 - 31 Aug. 1973
M. Brook, S. A. Colgate, C. R. Holmes, W. Hume, and J. D. Klett 31 Aug. 1973 91 p refs
(Contract N00014-68-A-0157)
(AD-775340) Avail: NTIS CSCL 04/1

The final report contains a general review of the six year operation including the names of graduate research assistants who earned advanced degrees, with abstracts of doctoral dissertations in an appendix; a listing for the six-year period of papers presented at meetings, journal papers published, and other publications; and research reports. Titles of the research reports are the following: Noise radar; Theoretical studies of ion populations in clouds; Calculations of electrical effects at the boundaries of electrically charged clouds; Atmospheric pressure studies; Radon studies; Cosmic ray experiment (detection of coincident EM and optical signals from extensive air showers). (Modified author abstract) GRA

N74-22087*# Stanford Univ., Calif. Inst. for Plasma Research.
GEOMAGNETIC RESPONSES TO THE SOLAR ACTIVITY
Leif Svalgaard 8 Nov. 1973 73 p refs
(Grant NGR-05-020-559; NSF GA-31138; Contract N00014-67-A-0112-0068; NR Proj. 323-003)
(NASA-CR-138176; AD-775556; SU-IPR-555) Avail: NTIS HC $6.75 CSCL 04/1

The paper presents a unified overview of present knowledge of the geomagnetic response to the dynamic solar wind. Physical understanding rather than observational details is emphasized. Following some historical notes, the formation of the magnetosphere and the magnetospheric tail is discussed. The importance of electric fields is stressed and the magnetospheric convection of plasma and frozen-in magnetic field lines under the influence of large-scale magnetospheric electric fields is outlined. Ionospheric electric fields and currents are intimately related to electric fields and currents in the magnetosphere and the strong coupling between the two regions is discussed. The energy input of the solar wind to the magnetosphere and upper atmosphere is discussed in terms of the reconnection model where interplanetary magnetic field lines merge or connect with the terrestrial field on the sunward side of the magnetosphere. (Modified author abstract) GRA

N74-22088# Office of Naval Research, London (England).
WAVE INTERACTION IN THE LOWER IONOSPHERE: A SURVEY
Arthur H. Waynick 4 Dec. 1973 16 p refs
(AD-774917; ONRL-R-30-73) Avail: NTIS CSCL 04/1

A summarization of the reviews to date on the field of wave interaction in the lower ionosphere is attempted. This covers the study of the interaction process and the determination of electron density, N, and electron-neutral collisional frequency, nu, height distributions in D-region. The current status of the use of this technique in synoptic profile procurement and the role of this work in investigations on the physics and chemistry of this region are outlined. Author (GRA)

N74-22089# Raven Industries, Inc., Sioux Falls, S.Dak. Flight Operations Dept.
SKYHOOK CHURCHILL 1973 Interim Report, Jan. - Dec. 1973
Tom Pappas and Paul S. White 18 Jan. 1974 119 p
(Contract N00014-73-C-0456; NR Proj. 211-177)
(AD-774966; R-0174002) Avail: NTIS CSCL 04/1

The program was funded to conduct balloon field operations from Fort Churchill, Manitoba and from Thompson, Manitoba, Canada. The contract also called for the delivery of three balloons to be used in the program. Raven provided a field crew, suspension and rigging hardware, aircraft and helicopter tracking, parachutes, balloon telemetry and control instrumentation, electronic tracking, and reports and documentation as necessary. This report describes individual flights, equipment used, flight data, and various program information. Author (GRA)

N74-22090# Geological Survey, Reston, Va. Water Resources Div.
CALIBRATION OF US GEOLOGICAL SURVEY RAINFALL/RUNOFF MODEL FOR PEAK FLOW SYNTHESIS-NATURAL BASINS
P. H. Carrigan, Jr. 11 Oct. 1973 115 p
(PB-226217/8GA; USGS-WRD-73-026) Avail: NTIS HC $4.25 CSCL 08H

The calibration is based on a short term record of daily rainfall, of daily evaporation, and of unit (5-60 min.) rainfall and unit discharge. The calibration adjusts 10 parameters of the model to seek the minimum mean square error in estimating surface runoff volume and/or flood peak magnitude. The user may select parameters for adjustment, events used in list of flood peaks, and mean square errors to be minimized. The printed output identifies records used for calibration, indicates periods of record and dates of events, provides comparison of observed and synthetic surface runoff volumes and peaks, and tabulates parameters and mean square errors at progressive stages in calibration process. (Modified author abstract) GRA

N74-22091# Woods Hole Oceanographic Institution, Mass.
REVIEW OF THE RESULTS FROM THE EASTERN ATLANTIC CONTINENTAL MARGIN PROGRAM OF THE INTERNATIONAL DECADE OF OCEAN EXPLORATION
K. O. Emery Oct. 1973 34 p refs
(Grant NSF GX-28193)
(PB-226580/9GA; WHOI-Ref-73-75; WHOI-Contrib-3218) Avail: NTIS HC $3.00 CSCL 08C

A large geophysical and geological study of the Eastern Atlantic Continental Margin is reported. Excellent results were obtained aboard ship with a computerized system of gravity, magnetics, and seismic reflection and refraction. Although not designed primarily for economic exploration, the cruises did map large sediment-filled basins and belts of salt diapiric structures, some of which were previously unreported and none of which were completely mapped. In addition, small pagoda structures discovered on the deep ocean floor may have some promise as sources for gas. Lastly, areas of coastal upwelling, large river discharge, and open-ocean divergence were outlined as areas being exploited for fish, and they include at least one that appears to be little exploited at present. (Modified author abstract) GRA

N74-22092# Stanford Research Inst., Menlo Park, Calif.
BASIC ELECTRICAL PARAMETERS OF THE ATMOSPHERE Final Report
E. T. Pierce Jan. 1974 26 p refs
(Contract N00014-71-C-0106; SRI Proj. 4454)
(AD-775317; SRI-4454-FR) Avail: NTIS CSCL 04/1

The report summarizes all the work accomplished since 1 March 1963 under Contract N00014-71-C-0106 and its predecessor, Contract Nonr-4099(00). The main achievements of the research have already been published in a series of 20 Scientific Notes; these notes--with their abstracts, where available--are listed. Investigations that have not been covered in a Scientific Note are cataloged and briefly described. Finally some comments are offered as to the probable future relevance to the mission of the U.S. Navy of research in atmospheric electricity. Author (GRA)

N74-22093# Geological Survey, Bay Saint Louis, Miss. Gulf Coast Hydroscience Center.
SURFACE JET STREAM EXCESS TEMPERATURE ANALYSIS Final Report
Elvis Mackenroth and Louis H. Motz Sep. 1973 34 p refs
(PB-226120/4GA; USGS-WRD-73-025) Avail: NTIS HC $3.75 CSCL 13B

The described computer program is based on a two-dimensional model which predicts the behavior of a heated surface jet discharging into an ambient flowing stream. Variables which are predicted include jet temperature and velocity decay, jet trajectory, and jet width. The model is based on a joint solution of a system of ordinary differential equations. Author (GRA)

N74-22094# Air Force Academy, Colo.
COMPUTATION TECHNIQUES FOR VARIOUS GRAVITY ANOMALY CORRECTION TERMS Final Report
Harry W. Emrick Dec. 1973 64 p refs
(AD-774596; USAFA-RR-73-8) Avail: NTIS CSCL 08/5

The various correction terms to the gravity anomaly in terms of the Modern Theories of Gravimetric Geodesy and some alternative computational procedures are discussed. The recommended computational procedures are an Iterative Solution (Bjerhammer and Moritz) and a Nonlinear Solution (Moritz). A six degree by six degree anomaly field, which is representative of a mountainous area, is established using available gravity and elevation data and Rapp's prediction program. The gravity anomaly correction term computational procedure and results are discussed to include: procedure for reduction to the level surface passing through the computation point; the integration requirement for the innermost area; methods for computation for outer areas using discrete mean block values and an alternative approach; test to determine whether to use linear, nonlinear, or iterative solutions. (Modified author abstract) GRA

N74-21864 Helsinki Univ. of Technology, Otaniemi (Finland).
ANALYSIS OF DIELECTRIC PROPERTIES AND NOISE TEMPERATURE OF SEA ICE FOR MICROWAVE REMOTE SENSING APPLICATIONS
M. Hallikainen *In its* European Microwave Conf. 1973 1973 4 p refs (For availability see N74-21860 13-09)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-22095* National Aeronautics and Space Administration. Pasadena Office, Calif.
THIN FILM GAUGE Patent
Angus D. McRonald, inventor (to NASA) (JPL) Issued 14 Mar. 1972 4 p Filed 29 May 1969 Supersedes N70-12618 (08 - 02, p 0288) Sponsored by NASA
(NASA-Case-NPO-10617-1; US-Patent-3,648,516; US-Patent-Appl-SN-828920; US-Patent-Class-73-190H) Avail: US Patent Office CSCL 14B

A thin film gauge for use in measuring distributed convective heat transfer rates occurring along given surfaces, is described. The gauge is particularly suited to measuring test surfaces in the air stream of a wind tunnel. The gauge is characterized by a plurality of painted platinum leads extend across the surface of a substrate; a pair of leads on the surface is adapted to deliver an electric current at a constant amperage through a selected thermally active area. Leads are also coupled at opposite sides of the thermally active area for detecting induced voltage drops occurring in the area so that the active length of the gauge is defined between voltage output leads. Changes in heat transfer to the thermally active area are isolated and determined by detecting induces changes in voltage drop.
Official Gazette of the U.S. Patent Office

N74-22096* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW LEVEL SIGNAL LIMITER Patent
Irving G. Hansen and Victor S. Peterson, inventors (to NASA) Issued 1 Oct. 1968 4 p Filed 22 Sep. 1966
(NASA-Case-XLE-04791; US-Patent-3,404,348; US-Patent-Appl-SN-582213; US-Patent-Class-330-103) Avail: US Patent Office CSCL 14B

A limiting circuit is described which prevents a signal being supplied to a signal amplifier from exceeding a predetermined value. The circuit is designed to permit a signal voltage to be fed directly to a signal amplifier without passing through the operational amplifier and without being altered undesirably. When the signal level increases to the predetermined value, the summing point shifts from the input of the operational amplifier to the output of the limiting circuit. D.L.G.

N74-22097*# California Univ., Berkeley. White Mountain Research Station.

WHITE MOUNTAIN RESEARCH STATION: 25 YEARS OF HIGH-ALTITUDE RESEARCH Final Technical Report
Nello Pace 1973 62 p refs
(Grant NGR-05-003-018)
(NASA-CR-138137) Avail: NTIS HC $6.25 CSCL 14B

The organization and functions of a test facility for conducting research projects at high altitudes are discussed. The projects conducted at the facility include the following: (1) bird physiology, (2) cardiorespiratory physiology, (3) endocrinological studies, (4) neurological studies, (5) metabolic studies, and (6) geological studies. Author

N74-22098*# Stanford Univ., Calif. Dept. of Electrical Engineering.
RESEARCH ON MINIATURE GAS ANALYSIS SYSTEMS Interim Status Report, Sep. - Dec. 1973
James B. Angell 2 Jan. 1974 33 p refs
(Grant NGR-05-020-690)
(NASA-CR-138138) Avail: NTIS HC $4.75 CSCL 14B

Technology for fabricating very small valves, whose function will be to introduce a small sample of the gas to be analyzed into the main carrier gas stream flowing through the chromatograph column is described. In addition, some analyses were made of the factors governing the resolution of gas chromatographs, particularly those with miniature columns. These analyses show how important the column lining thickness is in governing the ability of a miniature column to separate components of an unknown gas. A brief description of column lining factors is included. Preliminary work on a super small thermistor detector is included. Author

N74-22099*# Alabama Univ., Huntsville. Bureau of Engineering Research.
ACTIVE CONTROL OF PRIMARY MIRROR OF AN ORBITING TELESCOPE WITH THERMAL EXCITATION Final Report
James L. Hill and John N. Youngblood Mar. 1974 76 p refs
(Contract NAS8-28019)
(NASA-CR-120214; BER-171-09) Avail: NTIS HC $7.00 CSCL 14B

The generalization is presented that was made to model a layered structure of a kind that represents a light-weighted mirror. This theory is presented along with the strategy for error suppression. The results of a variety of error-suppression studies are also presented. The computer programs for all parts of this study are included. Author

N74-22100*# Kanner (Leo) Associates, Redwood City, Calif.
METHODS OF FILTERING PHOTOGRAPHIC IMAGES AND THE POSSIBILITY OF THEIR USE IN GEOLOGY
V. B. Komarov, V. F. Nomokonova, and Yu. V. Uglev Washington NASA Apr. 1974 10 p Transl. into ENGLISH from Acad. of Sci. USSR (Moscow), Apr. 1974 9 p
(Contract NASw-2481)
(NASA-TT-F-15550) Avail: NTIS CSCL 14E

Two methods of image filtration, optical and electronic, for seperating informative elements of an image from its photograph were developed. Methods involving the use of photographic equipment were also reported. The use of photographic filtering to determine the structural properties of geolotical objects was examined. E.H.W.

N74-22101# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioural Sciences Div.
EVALUATION OF THE AAU-19 ALTIMETER DISPLAY AS MODIFIED FOR THE CANADIAN FORCES
L. G. Innes Aug. 1973 14 p refs
(DCIEM-73-R-948) Avail: NTIS HC $4.00

The AAU-19 counter-drum-pointer altimeter display is in current use with several military forces and is being installed in the fleets of several civil air carriers. The modifications of the display for the Canadian forces are presented which involved a reduction in the drum window size to the same height as the counter window, and the addition of two static zeros to the right of the pivot point of the needle. The digit display on the drum changed from black on a grey ground to white on a black ground. Published research and evaluations of altimeter display designs are considered. Author

N74-22102*# Old Dominion Univ., Norfolk, Va.
INVESTIGATION OF GAS TEMPERATURE MEASUREMENTS USING ULTRAVIOLET EXCITATION Final Technical Report
George S. Ofelt Oct. 1973 18 p refs
(Grant NGR-47-003-005)
(NASA-CR-138114) Avail: NTIS HC $4.00 CSCL 14B

A high resolution spectrographic study has been made of the nitrogen first negative system as induced by ultraviolet radiation. The radiation used in this experiment was the neutral helium resonance radiation at 584 A. Nitrogen molecules at approximately 300 K and at a pressure of one torr were ionized by the ultraviolet radiation with the aid of a windowless experimental configuration. The resulting nitrogen fluorescence was analyzed with sufficient resolution to enable study of the intensities of the R branch rotational lines of the 0-0 vibrational band of the first negative system. The data indicate that the induced population of the upper levels approximates a Boltzmann Distribution at the ambient temperature of the gas. Author

N74-22103*# TRW Systems Group, Redondo Beach, Calif.
WET CHEMISTRY INSTRUMENT PROTOTYPE Final Report
31 Jan. 1974 165 p
(Contract NAS2-7198)
(NASA-CR-114767; TRW-23197-6001-RU-00) Avail: NTIS HC $11j25 CSCL 14B

A wet chemistry instrument prototype for detecting amino acids in planetary soil samples was developed. The importance of amino acids and their condensation products to the development of life forms is explained. The characteristics of the instrument and the tests which were conducted to determine the materials compatibility are described. Diagrams are provided to show the construction of the instrument. Data obtained from the performance tests are reported. Author

N74-22104# Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
COMPACT BIAS COIL SYSTEMS FOR GEOMAGNETIC MEASUREMENTS, Publications of the Earth Physics Branch, Volume 44, No. 10
P. H. Serson 1974 8 p refs
Avail: NTIS HC $4.00

Measurements of geomagnetic components with the proton magnetometer require a coil system for producing a homogeneous bias field in a direction which can be determined accurately. The theoretical advantages of various symmetrical arrangements of coils are reviewed, and the precision of mechanical construction necessary to achieve the theoretical performance is estimated. It is concluded that where a Helmholtz pair would be too large, the most practical choice is a system of four circular coaxial coils of equal diameter. Author

N74-22105# National Materials Advisory Board, Washington, D.C. Div. of Engineering.
MATERIALS FOR RADIATION DETECTION Final Report
Jan. 1974 362 p refs
(Contract DA-49-083-OSA-3131)
(NMAB-287) Avail: NTIS HC $21.25

The available information (complete through 1971) on detectors for the electromagnetic radiation spectrum in the wavelength range 10 to the minus 10th power to 1 cm. The detectors are divided according to wavelength range into four groups: (1) sensors for X-rays and gamma-rays; (2) sensors for ultraviolet, visible and near-infrared radiation; (3) detectors for infrared radiation from 2 to 200 micrometers; (4) detectors for far-infrared and millimeter wave radiation. Progress on a broad front in the understanding of materials and the production of devices useful in radiation detection is recognized, but limitations both in the quality and properties of available material and in fundamental understanding require intensive effort in a number of areas. Author

N74-22106*# Santa Barbara Research Center, Goleta, Calif.
STUDY OF SPIN-SCAN IMAGING FOR OUTER PLANETS MISSIONS: EXECUTIVE SUMMARY Final Report
E.E. Russell, R.A. Chandos, J.C. Kodak, S.F. Pellicori, and M.G. Tomasko (Ariz. Univ.) 27 Feb. 1974 17p

(Contract NAS2-7096)
(NASA-CR-114746) Avail: NTIS HC $4.00 CSCL 14E

The development and characteristics of spin-scan imagers for interplanetary exploration are discussed. The spin-scan imaging photopolarimeter instruments of Pioneer 10 and 11 are described. In addition to the imaging function, the instruments are also used in a faint-light mode to take sky maps in both radiance and polarization. The performance of a visible-infrared spin-scan radiometer (VISSR), which operates in both visible and infrared wavelengths, is reported. Author

N74-22107# Aeronautical Research Labs., Melbourne (Australia).
A-C EXCITED SELF BALANCING EQUIPMENT FOR MEASURING STRAIN GAUGE BALANCE OUTPUTS
N. Pollock Sep. 1973 17 p refs
(ARL/A-Note-341) Avail: NTIS HC $4.00

A system for measuring the outputs from A-C excited wind tunnel strain gauge balances is described. The system is a current injection nulling type using integrated circuits. It has excellent noise rejection characteristics, is unaffected by thermal E.M.F.'s, does not require power supplies of extremely high stability and gives a high level D-C output (up to 14 Volts.) suitable for driving an analog to digital converter. Two single channel prototypes were constructed. One of these prototypes incorporated an automatic quadrature rebalancing feature which removed the need for the quadrature balance control required by most A-C systems. The prototypes had good resolution, linearity, drift and gain stability characteristics. The cost of the equipment described is surprisingly small considering its performance. The component cost for the prototype with automatic quadrature rebalancing (excluding, output A to D converter and power supplies) was about $100 per channel. Author

N74-22108*# Techtran Corp., Silver Spring, Md.
METHOD AND EXAMPLE OF STUDYING AERIAL PHOTOGRAPHS OF THE NAUTRAL FRACTURING OF CARBONATES
P. Bouche and M. Poulet Washington NASA Mar. 1973 25 p refs Transl. into ENGLISH from Rev. Inst. Franc. Petrole (Paris), vol. 26, no. 1, 1971 p 1-21
(Contract NASw-2485)
(NASA-TT-F-14730) Avail: NTIS HC $4.25 CSCL 14E

Leading methodological information provided by aerial photographic examination of natural fracturing of carbonates in two areas of northern Algeria: The Djebel Onk and the Djebel Nador, is reported. Author

N74-22109*# National Aeronautics and Space Administration, Washington, D.C.
HOLOGRAPHIC DIFFRACTION GRATINGS
Jean Cordelle Sep. 1973 9 p refs Transl. into ENGLISH from Atomes (France), v. 24, no. 271, Dec. 1969 p 763-765
(NASA-TT-F-14752) Avail: NTIS HC $4.00 CSCL 14E

A process is described which produces a grating on a substrate 150 x 150 mm in area in twenty minutes. A support made of glass or any other optically polished material is coated with a layer of photopolymerizable resin which records the interference phenomenon produced by two coherent point sources defined by a laser. The resin polymerizes along the bright fringes and can then be dissolved in a suitable developer. After rinsing and drying, a diffraction grating is obtained which can be metallized. A study of these optical systems indicates that no aberration exists for wavelengths determined by simple geometric considerations. D.L.G.

N74-22110*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CMG-INDUCED LST DYNAMICS
Sherman M. Seltzer 21 Feb. 1974 80 p refs
(NASA-TM-X-64833) Avail: NTIS HC $7.00 CSCL 14B

The application of control moment gyroscopes to the pointing and control system of the large space telescope is discussed. The parameter plane analysis technique is used to present the nonlinearity representing the control moment gyroscope gimbal bearing friction. The technique affords both analytic and graphic portrayal of the effects of variations is selected system parameters. Diagrams of the systems involved in the tests are presented. Author

N74-22111# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
AN EVALUATION OF SELECTED ANGULAR MOMENTUM, CORTEX SHEDDING AND ORIFICE CRYOGENIC FLOWMETERS Interim Report
J. A. Brennan, R. W. Stokes, C. H. Kneebone, and D. B. Mann Mar. 1974 69 p refs Cosponsored by the Compressed Gas Assoc.
(NBS Proj. 2750360)
(NBS-TN-650) Avail: SOD HC $0.65 as C13.46:640

A research program on cryogenic flow measurement was conducted. Cryogenic flowmeters operating on the principles of angular momentum (mass flow), vortex shedding (volume flow), and pressure drop are reported. The operation and accuracy of the test facility is described. The performance of the flowmeters in liquid nitrogen is analyzed by reporting the precision and bias of the meters before and after an eighty hour stability test and by defining the existence of temperature, pressure, flow rate, subcooling, and time order (wear) dependencies. Author

N74-22112*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PARTICULATE AND AEROSOL DETECTOR Patent Application
Jimmie J. Wortman (Res. Traingle Inst.), Robert P. Donovan (Res. Triangle Inst.), Arthur P. Brooks (Res. Triangle Inst.), Larry K. Monteith (Res. Triangle Inst.), William H. Linard, and Robert L. ONeal, inventors (to NASA) Filed 26 Apr. 1974 13 p
(NASA-Case-LAR-11434-1; US-Patent-Appl-SN-464722) Avail: NTIS HC $4.00 CSCL 14B

The invention relates to a device for detecting and counting micron size particles suspended in a gas. The basic principle of the sensor operation is that a charged capacitor can have a discharge initiated by the impact of a high velocity particle. With suitable construction methods and under appropriate biasing and impacting conditions, the impacting particle creates a discharge path which is self-healing; that is, the incident particle initiates a discharge path through which the capacitor discharges in such a fashion as to vaporize or blow out the conducting path in the process. Once the discharge action is complete, the low resistance path no longer exists between the two capacitor plates and the capacitor is again able to accept a charge. By monitoring the voltage on a capacitor plate the density and size of particles directed into the capacitor can be determined. NASA

N74-22113*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LIGHTNING CURRENT MEASURING SYSTEMS Patent Application
Ronald J. Wojtasinski, James H. Jones, and Raymond V. Lisle, inventors (to NASA) Filed 15 Apr. 1974 14 p
(NASA-Case-KSC-10807-1; US-Patent-Appl-SN-461073) Avail: NTIS HC $4.00 CSCL 14B

An apparatus for monitoring and analyzing electrical currents produced by lightning strikes is described. The apparatus includes an electrically conductive mast which has currents produced responsive to lighting strikes. A first circuit means is coupled to the mast for generating DC voltage proportional to a peak current generated in the mast by each lightning strike. The first circuit includes a first coil encircling the mast for sensing the flux change produced by current flowing through the mast which is caused by a lightning strike and for generating a voltage responsive thereto. An integrator is coupled to the first coil for generating an integrated voltage proportional to the flux change sensed by the first coil. A peak voltage detector is coupled to the integrator for generating a voltage having an amplitude proportional to the peak of the integrated voltage. A second circuit means is coupled to the mast for generating digital signal representative of the wave shape of the current generated in the mast by each lightning strike. Author

N74-22114# Lockheed Missiles and Space Co., Palo Alto, Calif.
SCIENTIFIC APPARATUS TO STUDY COSMIC RAYS ON

THE "PROGNOZ" SATELLITES. 2
N. N.02Vorobev Volodichev, A. I., N. L. Grigorov, G. Ia. Kolesov, M. I. Kudriavtsev, O. B. Likin, V. N. Lutsenko, A. S. Melioranskii, E. I. Morozova, N. I. Nazarova et al 20 Dec. 1972 6 p refs Transl. into ENGLISH from Geomagn. Aeron. (USSR), Vol. 13, No. 5, 1973 p 801-806
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The scientific instruments on the Prognoz and Prognoz-2 for the study of electron, X-ray, and gamma ray fluxes are described. Methods of tapping the information to the telemetry system are examined. The diagrams of four instruments among the complex of scientific equipment on the Prognoz and Prognoz-2 for the study of cosmic rays are examined. The remaining instruments in this group are described and data are also presented about the physical characteristics of the instruments and about the methods of tapping the scientific information from them.
Author

N74-22115*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MULTI-SENSOR ANALYSIS OF NIMBUS 5 DATA ON 22 JANUARY 1973
L. J. Allison, E. B. Rodgers (Environ. Res. and Technol., Inc., Lexington, Mass.), T. T. Wilheit, and R. Wexler Jan. 1973 58 p refs
(NASA-TM-X-70633; X-910-74-20) Avail: NTIS HC $6.00 CSCL 14B

The Nimbus 5 meteorological satellite carried aloft a full complement of radiation sensors, the data from which were analyzed and intercompared during orbits 569-570 on 22 January 1973. The electrically scanning microwave radiometer (ESMR) which sensed passive microwave radiation in the 19.35 GHz region, delineated rain areas over the ocean off the U.S. east coast, in good agreement with WSR-57 and FPS-77 radar imagery and permitted the estimation of rainfall rates in this region. Residual ground water in the lower Mississippi Valley, which resulted from abnormal rainfall in previous months, was indicated under clear sky conditions by soil brightness temperature values in the Nimbus 5 ESMR and U.S. Air Force Data Acquisition and Processing Program (DAPP) IR data. The temperature-humidity infrared radiometer showed the height and spatial configuration of frontal clouds along the east coast and outlined the confluence of a polar jet stream with a broad sub-tropical jet stream along the U.S. Gulf Coast. Temperature profiles from three vertical temperature sounders, the infrared temperature profile radiometer (ITPR), the Nimbus E microwave spectrometer (NEMS) and the selective chopper radiometer (SCR) were found to be in good agreement with related radiosonde ascents along orbit 569 from the sub-tropics to the Arctic Circle. Author

N74-22116# Technisch Physisch Dienst TNO-TH, Delft (Netherlands). Instrumentation Div.
MOON SENSOR FOR LUNAR OCCULTATION MISSION, SECOND STUDY
A. Hammerschlag Jan. 1972 160 p
(Contract ESTEC-1425/71/EL)
(Rept-111-570; ESRO-CR(P)-143) Avail: NTIS HC $11.00

A comparison is made between photomultipliers and silicon photodetectors for use in the visible range of the spectrum on a lunar occultation satellite. Investigations into the overload capabilities of photomultipliers; semiconductor-detector preamplifier combination; semiconductor-detector properties; and strong light and baffling are made. For individual titles, see N74-22117 through N74-22118.

N74-22117 Technisch Physisch Dienst TNO-TH, Delft (Netherlands).
[COMPARISON BETWEEN PHOTOMULTIPLIERS AND SILICON PHOTODETECTORS FOR USE AS DETECTORS ON LASER OCCULTATION SATELLITE]
In its Moon Sensor for Lunar Occultation Mission Jan. 1972 113 p (For availability see N74-22116 13-14)

Photomultipliers, preamplifiers, semiconductors, and silicon detectors were tested as to the purpose, shutter, and vibrating qualities of the mechanisms. The preliminary design and specifications of a moon sensor are described, including sun, exterior, and interior baffles; optical unit and rail; beam splitters, choppers; and signal processing section. ESRO

N74-22118 New Industrial Concepts, Ltd., London (England).
ASSESSMENT OF THE STRAY LIGHT PROBLEM AND PROPOSALS FOR FURTHER STUDY
A. Boksenberg, D. G. Davis, and M. J. Esten *In* Tech. Phys. Dienst TNO-TH Moon Sensor for Lunar Occultation Mission Jan. 1972 36 p (For availability see N74-22116 13-14)

Sources of stray light are considered and mechanisms for its transfer to the sensor described and evaluated. A program for further study of the problem is proposed taking into account computational and measurement requirements. ESRO

N74-22119# Saab-Scania, Linkoping (Sweden).
SATELLITE ATTITUDE CONTROL AND STABILISATION USING ON-BOARD COMPUTERS
B. Schmidtbauer, Hans Samuelsson, and Arne Carlsson Paris ESRO Jul. 1973 454 p refs
(Contract ESTEC-1368/71)
(ESRO-CR-100) Avail: NTIS HC $25.75

Onboard computer attitude control systems are considered that use linear stochastic techniques for single- and multiple-axis stabilization problems. For individual titles, see N74-22120 through N74-22122.

N74-22120 Saab-Scania, Linkoping (Sweden).
SYSTEMS AND COMPONENTS SURVEY
Hans Samuelsson *In its* Satellite Attitude Control and Stabilisation Using On-Board Computers Jul. 1973 p 1-165 refs (For availability see N74-22119 13-14)

A survey of attitude control systems and components for onboard computer applications was carried out on the basis of available open literature. It is believed that all main active and semi-active attitude control principles have been covered. Among the systems considered were dual spin, fly wheel, jet, reaction wheel, and control moment gyros. The components described cover star, solar, horizon magnetic, inertial, and other sensors.
ESRO

N74-22121 Saab-Scania, Linkoping (Sweden).
SYSTEMS ANALYSIS AND PERFORMANCE EVALUATION **c10**
B. Schmidtbauer *In its* Satellite Attitude Control and Stabilisation Using On-board Computers Jul. 1973 p 167-392 refs (For availability see N74-22119 13-14)

The elements of modern control theory are elaborated and applied to the problem of satellite attitude control, with emphasis on the use of onboard computers. The TD-1A satellite mission is described by way of an example. Tradeoffs and benefits of utilizing onboard computers for attitude control systems are discussed. A number of appendices on various control aspects are included. ESRO

N74-22122 Saab-Scania, Linkoping (Sweden).
COMPUTER PROGRAMME DOCUMENTATION **c08**
A. Carlsson and B. Schmidtbauer *In its* Satellite Attitude Control and Stabilisation Using On-board Computers Jul. 1973 p 391-438 (For availability see N74-22119 13-14)

The computer programs - linear estimation programs, linear-quadratic synthesis program, simulation program and subroutines - used in surveying the application of onboard computers to satellite attitude control systems are described.
ESRO

N74-22123# United Kingdom Atomic Energy Authority, Harwell (England).
CORRECTIONS TO THE DETECTION EFFICIENCY OF Li-6 SEMICONDUCTOR SANDWICH SPECTROMETERS
P. J. Clements Oct. 1973 16 p refs
(AERE-R-7512) Avail: AEC Depository Libraries HC $3.00; HMSO 50p; PHI $2.15

Li-6 semiconductor sandwich spectrometers are used for the measurement of neutron spectra in a variety of applications. In the past, several spectrometer designs of differing internal construction have been used with little attention being paid to the scattering properties of the construction materials. It has now been shown that neutron scattering in the materials

surrounding the sensitive region of the spectrometer can lead to backgrounds as high as approximately 35% in one particular design. Author (NSA)

N74-22124# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronics and Space Systems Group.
STUDY AND EVALUATION OF THE ESRO 4 SATELLITE HORIZON CROSSING INDICATOR IN-ORBIT DATA, PART 3 Final Report
M. J. Brewer Nov. 1973 207 p refs
(Contract ESTEC-1489/71-AA)
(ESS/SS-533; ESRO-CR(P)-384) Avail: NTIS HC $13.50

Kalman filter software was used to evaluate the performance of the ESRO 4 satellite Horizon Crossing Indicator (HCI) from the experimenter magnetic tapes, which contain data telemetered back from the satellite and satellite auxiliary data. The processing was carried out using telemetry tapes which covered the first six months of life of the satellite. The satisfactory performance of the filter using the real data from the tapes was verified. A comprehensive analysis was then performed to produce satellite attitude histories, HCI calibration curves and an assessment of satellite principle axis tilt. A description is also given of the main features of the theoretical analysis and the development and testing of the filter programs. ESRO

N74-22125# Danish Meteorological Inst., Charlottenlund. Geophysics Div.
FLUXGATE SENSORS: PRINCIPLES AND PROPERTIES
F. Primdahl 1973 44 p refs
(R-36; ISBN-87-7478-083-2) Avail: NTIS HC $5.25

The principle of the fluxgate mechanism, based on changing permeability in a coil core, is discussed. The magnetometer uses the sensor as a null indicator balancing out the field along the sensor axis by feed-back technique. Examples of frequency- and step-response are given together with noise, reproducibility, offset, drift, temperature-dependence, temperature compensation, and long-term stability. The conclusion is that the fluxgate is a realistic alternative in primary observatory instrumentation with the additional advantage of compatibility with automatic data processing. Author (ESRO)

N74-22126# Arbeitsgruppe fuer Physikalische Weltraumforschung, Freiburg (West Germany).
MODEL COMPUTATIONS AND MEASUREMENTS CONCERNING THE AEROS-EUV SPECTROMETER [MODELLRECHNUNGEN-UND MESSUNGEN ZUM AEROS-EUV SPEKTROMETER]
Gerhard Schmidtke, Konrad Schmidt, and Clemens Rebstock Bonn Bundesmin. fuer Forsch. und Technol. Nov. 1973 31 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FBW-73-20) Avail: NTIS HC $4.75; ZLDI, Munich 6,10 DM

The effect of the solar pointing control and the satellite spin parameters on quality of recorded spectra were computed and measured for a model of the AEROS-EUV spectrometer. The measuring program of this spectrometer is strongly dependent on the behavior of these two parameters. As a result two measuring modes have been introduced: mode 1 (pointing error below 1.5 deg) the stepping motor runs through 492 steps at 2 Hz evenly, and mode 2 (pointing error at least 1.5 deg) the spectrometer makes measurements with 4 Hz in the angular range from -60 deg over 0 deg to 60 deg, respectively, from 300 to 420 deg of rotation. ESRO

N74-22127# Universitaets-Sternwarte Goettingen (West Germany).
INVESTIGATIONS ON HOLOGRAPHIC DIFFRACTION GRATINGS FOR STELLAR SPECTROSCOPY [UNTERSUCHUNGEN UEBER HOLOGRAPHISCHE BEUGUNGSGITTER FUER DIE STERNSPEKTROSKOPIE]
Guenter Schmahl Bonn Bundesmin. fuer Forsch. und Technol. Nov. 1973 75 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FB-T-73-16) Avail: NTIS HC $6.75; ZLDI, Munich 15,35 DM

A high resolution diffraction grating for large astronomical telescopes, made holographically using laser light and photoresistance layers, is discussed. Production methods for gratings are discussed along with results with plane reflectance gratings up to a width of 180 mm and concave gratings up to a diameter of 350 mm. A holographic diffraction grating for Coude spectrographs, used in connection with large mirror telescopes is detailed. ESRO

N74-22128# European Space Research Organization, Paris (France).
ASSESSMENTS OF COCKPIT DISPLAYS
R. Beyer (DFVLR, Brunswick) Mar. 1974 32 p refs Transl. into ENGLISH of Wirksamkeitsuntersuchungen von Anz. fuer die Flugfuehrung, DLR-FB-73-03, DFVLR, 1973
(ESRO-TT-31; DLR-FB-73-03) Avail: NTIS HC $4.75; Original report in GERMAN: DFVLR, Porz, West Ger. 9,50 DM

The development of new and predominantly electronic display techniques leads to an increasing interest in methods for the assessment and evaluation of displays. Examples of methods based on flight control, experimental psychology, physiological, and subjective measurements are discussed and supported by results obtained from some experimental studies.

Author (ESRO)

N74-22129# Woods Hole Oceanographic Institution, Mass.
THE TOKYO SURFACE SHIP GRAVITY METER: RECENT DEVELOPMENTS FOR SOLVING NON-LINEAR RECITIFICATION ERROR AND PHASE LAG PROBLEMS
Jiro Segawa and Carl Bowin Dec. 1973 46 p refs Prepared in cooperation with Tokyo Univ., Japan
(Contract N00014-66-C-0241; Grant NSF GF-39056)
(AD-773548; WHOI-73-89) Avail: NTIS CSCL 08/5

The Tokyo Surface Ship Gravity Meter (T.S.S.G.) has been using the frequency of a single vibrating string to measure vertical acceleration. An important source of error caused by a non-linear relationship between the frequency of vibration and environmental acceleration, has been suspected since the T.S.S.G. was first used. A new data processor for the T.S.S.G. has been constructed which is based on a rapid reading of frequency of vibration by means of pulse train logic. Results from the new processor have been compared with the results from the conventional method of data processing, and the authors have confirmed an improved performance of the new processor. The problem of the phase lag of measurement which occurs when an analogue type low pass filter is used is discussed, and a method to remove the phase lag by use of a deconvolution filter is described. (Modified author abstract) GRA

N74-22130# Naval Missile Center, Point Mugu, Calif.
NAVAL MISSILE CENTER PHOTO DATA ANALYSIS OF STORE-SEPARATION FILMS
G. F. Cooper and R. W. Kingery 17 Jan. 1974 54 p
(AD-775283; NMC-TP-73-57) Avail: NTIS CSCL 17/8

The Naval Missile Center has developed a novel method of store-separation analysis which uses the PDAS (photo data analysis system) and an IBM-7094 computer. It has greater speed and accuracy than the older conventional method. The PDAS involves superposition of two images, flight-test movie image of the separating store and an image of a scale model of the store, by video mixing. At superposition, the positional relationship of the store to its camera is proportional to that of the model and its camera. Lens distortion is bypassed because the flight-test camera lens is used on the model-viewing video camera. A six-degree-of-freedom, operator-controlled positioner orients the model in the field of view of its camera. High accuracy in position data extracted from the test is possible because many raster points are used in image superposition while the conventional system uses only a cross-hair intersection point. (Modified author abstract) GRA

N74-22131# Naval Postgraduate School, Monterey, Calif.
DESIGN REPORT OF HYBRID COMPRESSOR AND ASSOCIATED TEST RIG Final Report
Michael H. Vavra Jul. 1973 285 p refs
(AD-774873; NPS-57VA73071A) Avail: NTIS CSCL 14/2

The report presents the aerodynamic calculations and describes the mechanical features of a test rig that has been designed at the Turbopropulsion Laboratory, Department of Aeronautics, for research work on a special type of centrifugal

compressor. This so-called Hybrid compressor consists of a centrifugal rotor with 180 deg flow deflection in the meridional plane followed by an axial flow diffusor. The report establishes a method to predict the off-design performance of the compressor, which can be applied also to conventional centrifugal compressors. Extensive use is made of modern programmable calculators, and programs are presented to show the effectiveness of these tools in engineering endeavors. Author (GRA)

N74-22132# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
INSTRUMENT TO MONITOR CH4, CO, AND CO2 AUTO EXHAUST Final Report
D. E. Burch and J. D. Pembrook Oct. 1973 47 p refs
(Contract EPA-68-02-0587)
(PB-226438/0GA; EPA-650-2-73-030) Avail: NTIS HC $3.00 CSCL 07D

An infrared analyzer employing gas cell correlation techniques and thermoelectrically cooled photodectors has been designed and constructed to measure the concentrations of methane, carbon monoxide, and carbon dioxide in automotive exhausts. A wide dynamic detection range is made possible by employing two different sample cell lengths for each gas. The concentrations of the three gases are measured simultaneously eand independently. Discrimination against other gases in the automotive exhaust is very good. (Modified author abstract) GRA

N74-22133# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONTROL OF AN ABSOLUTE GRAVIMETER
V. G. Tarasyuk 11 Dec. 1973 9 p refs Transl. into ENGLISH on the mono. "Izmerenie Absolyutnogo Znacheniya Gravitatsionnogo Uskoreniya" Novosibirsk, 1972 p 74-78
(AD-773496; FTD-HT-23-771-74) Avail: NTIS CSCL 08/5

A unit for the general control of a gravimeter was developed. It is intended for the automation of all operations in raising, implacing, and lowering a freely falling optical reflector and for the automatic start-up of the counter unit and the recorders at prescribed moments of time. Also, where necessary, it provides for the accomplishment of all operations manually. GRA

N74-22134# Maryland Univ., College Park. Dept. of Physics and Astronomy.
MEASUREMENT OF X-RAY CROSS SECTIONS RELEVANT TO A SCANNING ION MICROSCOPE Annual Report, 1 Jul. 1972 - 30 Jun. 1973
Robert K. Cacak, Song Sik Choe, and Frederick W. Martin 26 Oct. 1973 38 p refs
(Contract N00014-67-A-0239-0026; NR Proj. 136-925)
(AD-775547; TR-74-035; AR-1) Avail: NTIS CSCL 14/2

The purpose of the study is to determine the feasibility of using X rays generated by heavy ion-atom collisions as the monitoring signal in an ion microscope. Experimental progress in the design, construction, and operation of an experimental apparatus to measure the rate of X-ray production by heavy ions is described. Particular attention is paid to a new type of soft X-ray spectrometer. Preliminary X-ray cross sections obtained with the described apparatus are presented for 1.0 to 2.5 MeV ions incident upon a thin carbon target. The cross sections are found to increase with ion velocity in the range studied. (Modified author abstract) GRA

N74-22135# Bureau of Mines, Washington, D.C.
EVALUATION OF INSTRUMENTATION FOR MEASURING BEHAVIOR OF AEROSOLS IN SMOG-CHAMBER STUDIES
H. B. Carroll, Jr. and R. M. Ray Nov. 1973 27 p refs
(PB-226229/3GA; BM-RI-7818) Avail: NTIS HC $3.00 CSCL 14B

The adaptability of the nephelometer and the smoke meter for use in routine analytical, smog chamber experiments is considered and their responses to aerosol during these experiments are compared. Both instruments sampling systems were modified--smaller size sample system was added to the smoke meter to allow measurement of Aitken or condensate nuclei. A correlation was shown to exist between the two instruments responses to aerosol. This correlation makes it possible to report the measurements in visibility and/or mass units if desired. (Modified author abstract) GRA

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-22136* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AIRLOCK Patent
Hal R. Linderfelt, inventor (to NASA) (McDonnell-Douglas Corp., Huntington Beach, Calif.) Issued 30 Apr. 1974 20 p Filed 24 Jan. 1972 Sponsored by NASA
(NASA-Case-MFS-20922-1; US-Patent-3,807,656; US-Patent-Appl-SN-220274; US-Patent-Class-244-1SS; US-Patent-Class-49-68; US-Patent-Class-61-83) Avail: US Patent Office CSCL 13G

An airlock for use in transferring waste objects from a positively pressurized enclosure aboard an operative space vehicle, to a waste receiver attached to the vehicle and maintained at the negative pressure of a celestial space environment. The airlock is characterized by a shell having an internal chamber and hermetically sealed within an opening formed in a bulkhead of the enclosure. The shell is provided with an insertion hatch adjacent to the enclosure, and an ejection hatch adjacent the waste receiver, each of the hatches being hermetically sealed by a hatch cover supported for deployment to a hatch-opening disposition through a manipulation of a hatch-deploying mechanism. A three-way selector valve is coupled with the deploying mechanism and ported to an internal chamber of the shell, the enclosure, and the environment and is provided for alternately coupling the chamber with the enclosure and the receiver, in direct communication, in response to a manipulation of the mechanism whereby a sequence is imposed on the operation of the airlock.
Official Gazette of the U.S. Patent Office

N74-22137*# Linguistic Systems, Inc., Cambridge, Mass.
MAGNETIC BEARINGS FOR HIGH SPEED ROTORS
Dietrich Scheffer Washington NASA Jan. 1974 16 p refs Transl. into ENGLISH from Messtechnik (West Germany), v. 1, Jan. 1972 p 1-6
(Contract NASw-2482)
(NASA-TT-F-14788) Avail: NTIS HC $4.00 CSCL 13I

A design for a magnetic bearing or an elongated rotor is discussed. The requirements imposed on the magnetic bearing by the rotor are discussed in the light of gyrodynamic considerations. The result and the requirements on the controllers of the magnetic bearing are discussed and a simple design for a controller is described. A new method for determining precession angular velocity of the rotor during its operation and the results obtained are presented. Author

N74-22138*# Kanner (Leo) Associates, Redwood City, Calif.
DIFFUSION WELDING IN AVIATION TECHNOLOGY
Klodbimierz Karlinski Washington NASA Apr. 1974 14 p refs Transl. into ENGLISH from Tech. Lotnicza Astronaut. (Warsaw), v. 27, Jul. 1973 p 25-28
(Contract NASw-2481)
(NASA-TT-F-15568) Avail: NTIS HC $4.00 CSCL 13H

Diffusion welding of special heat-resistant alloys for aerospace applications is described in terms of the main process parameters, the required equipment, and the properties of bonds made between various materials. Attention is given to surface cleaning requirements, vacuum and temperature levels used in the process, and the compression of the welded surfaces. Tabulated mechanical properties characterize bonds obtained between steels, heat-resistant alloys, and titanium alloys. Author

N74-22139*# Scientific Translation Service, Santa Barbara, Calif.
EXPERIMENTS AND OBSERVATIONS ON STERILIZATION OF THERMOLABILE OBJECTS WITH PERACETIC ACID
M. Sproessig, H. Muecke, and R. Domnick Washington NASA May 1974 23 p refs Transl. into ENGLISH from Pharm. (West Ger.), v. 29, no. 2, 1974 p 132-137
(Contract NASw-2483)

(NASA-TT-F-15572) Avail: NTIS HC $4.25 CSCL 20M

The sterilizing action of liquid and gaseous peracetic acid was tested in germ carrier experiments. It was found that the success is practically independent of whether the germ carriers are made of rubber, polyethylene, polyvinyl chloride or polystyrene. On the basis of the results obtained, parameters are recommended for the action of dilute peracetic acid for reliable and pleasing attainment of sterility. Recommendations are also given for pretreatment and post-treatment of the objects to be sterilized. Author

N74-22140*# Industrial Tectonics, Inc., Compton, Calif. Research and Development Div.

EXPERIMENTAL BALL BEARING DYNAMICS STUDY Final Report

Hans R. Signer Oct. 1973 118 p refs

(Contract NAS3-16730)

(NASA-CR-134528; ITI-P-1246) Avail: NTIS HC $9.00 CSCL 13I

A photographic method was employed to record the kinematic performance of rolling elements in turbo machinery ball bearings. The 110 mm split inner ring test bearings had nominal contact angles of 26 deg and 34 deg. High speed films were taken at inner ring speeds of 4,000, 8,000 and 12,000 rpm and at thrust loads of 4,448 N and 22,240 N (1,000 and 5,000 lbs). The films were measured and this data reduced to obtain separator speed, ball speed and ball spin axis orientation. Author

N74-22141*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF STRAIN HARDENING ON FRICTION BEHAVIOR OF IRON LUBRICATED WITH BENZYL STRUCTURES

Donald H. Buckley and William A. Brainard Washington May 1974 17 p refs

(NASA-TN-D-7661; E-7842) Avail: NTIS HC $3.00 CSCL 11H

Sliding friction experiments were conducted with iron, copper, and aluminum in contact with iron in various states of strain. The surfaces were examined in dry sliding and with various benzyl compounds applied as lubricants. Friction experiments were conducted with a hemispherical rider contacting a flat disk at loads of from 50 to 600 grams with a sliding speed of 0.15 cm/min. Results indicate that straining increases friction for dry sliding and for surfaces lubricated with certain benzyl structures such as dibenzyl disulfide. With other benzyl compounds (e.g., benzyl formate), friction coefficients are lower for strained than for annealed iron. Author

N74-22142*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

PARTS, MATERIALS, AND PROCESSES EXPERIENCE SUMMARY, VOLUME 1

Washington NASA 1973 347 p refs

(Contract NAS2-6060)

(NASA-SP-6507-Vol-1-Rev) Avail: NTIS HC $7.50 CSCL 13H

A summary of problems involving problems with parts, materials, and processes which have been identified under the ALERT program is presented. The basic purpose of the ALERT program is the avoidance, or at least the minimization, of the recurrence of parts, materials, and processes problems, thus improving the reliability of equipment produced for and used by the Government. An ALERT report is prepared when an item is believed to be in common usage and the problem may affect other users. The data include fundamental concepts followed by problems that have been experienced and suggestions for their avoidance and guidelines for producing good parts and materials. Author

N74-22143*# Martin Marietta Corp., Denver, Colo.

FLIGHT PROTOTYPE REGENERATIVE PARTICULATE FILTER SYSTEM DEVELOPMENT Final Report

Donald C. Green and Paul J. Garber May 1974 141 p

(Contract NAS9-12685)

(NASA-CR-134269; MCR-74-52) Avail: NTIS HC $10.25 CSCL 13G

The effort to design, fabricate, and test a flight prototype Filter Regeneration Unit used to regenerate (clean) fluid particulate filter elements is reported. The design of the filter regeneration unit and the results of tests performed in both one-gravity and zero-gravity are discussed. The filter regeneration unit uses a backflush/jet impingement method of regenerating fluid filter elements that is highly efficient. A vortex particle separator and particle trap were designed for zero-gravity use, and the zero-gravity test results are discussed. The filter regeneration unit was designed for both inflight maintenance and ground refurbishment use on space shuttle and future space missions. Author

N74-22144# National Materials Advisory Board, Washington, D.C. Div. of Engineering.

DIRECT REDUCTION PROCESSES FOR THE PRODUCTION OF TITANIUM METAL

Mar. 1974 94 p refs

(NMAB-304) Avail: NTIS HC $7.75

The technology for the production titanium is discussed. Domestic commercial production of titanium has been achieved using three different technologies which are described. The advantages of each process are analyzed. Alternative approaches are identified as follows: (1) non-electrolytic routes starting with titanium halides, (2) processes involving no halogenation, and (3) electrolytic processes. Author

N74-22145*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AN INTERNALLY SUPPORTED FLEXIBLE DUCT JOINT Patent Application

Ralph F. Kuhn, Jr., inventor (to NASA) (Rocketdyne) Filed 16 Apr. 1974 14 p Sponsored by NASA

(NASA-Case-MFS-19193-1; US-Patent-Appl-SN-461477) Avail: NTIS HC $4.00 CSCL 13G

The development of an internally supported flexible duct for conducting fluids under high pressures in systems where relatively large deflection angles must be accomodated is discussed. The device is based on coaxially aligned bellows assemblies to provide flexibility with high internal pressures. Diagrams of the invention are provided and specific applications are proposed. P.N.F.

N74-22146*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ANTI-GRAVITY DEVICE Patent Application

Sudarshan Pal Singh, inventor (to NASA) (NAS-NRC) Filed 22 Apr. 1974 11 p Sponsored by NASA

(NASA-Case-MFS-22758-1; US-Patent-Appl-SN-462706) Avail: NTIS HC $4.00 CSCL 20K

A device for demonstrating the effects of gravity was developed. The device consists of two spheres of different radii, a small sphere resting on top of a larger one. The center of gravity of the small sphere is located below its geometric center. When the small sphere is rolled without slippage on the surface of the large sphere and then released, the small sphere will resume its original position, thus seeming to defy the law of gravity. The desired results will only be obtained if the small sphere is moved through an angle of less than 30 degrees. P.N.F.

N74-22147*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPARATUS FOR FORMING DISHED ION THRUSTER GRIDS Patent Application

Bruce A. Banks, inventor (to NASA) Filed 22 Apr. 1974 11 p

(NASA-Case-LEW-11694-2; US-Patent-Appl-SN-462903) Avail: NTIS HC $4.00 CSCL 13I

The invention of an apparatus for forming matched pairs of dished grids having a high percentage of open areas for ion thruster accelerator systems is discussed. All the blanks and sheets are dished simultaneously by forcing fluid to inflate an elastic sheet which causes the desired degree of distortion. The dished grids are also stress relieved simultaneously. Diagrams of the forming device are provided. NASA

N74-22148*# Industrial Tectonics, Inc., Compton, Calif. Research and Development Div.

DESIGN, FABRICATION, AND OPERATION OF A TEST RIG FOR HIGH-SPEED TAPERED-ROLLER BEARINGS Final

Report
Hans R. Signer Jan. 1974 51 p
(Contract NAS3-16812)
(NASA-CR-134595; ITI-P-1248) Avail: NTIS HC $5.75 CSCL 13I

A tapered-roller bearing test machine was designed, fabricated and successfully operated at speeds to 20,000 rpm. Infinitely variable radial loads to 26,690 N (6,000 lbs.) and thrust loads to 53,380 N (12,000 lbs.) can be applied to test bearings. The machine instrumentation proved to have the accuracy and reliability required for parametric bearing performance testing and has the capability of monitoring all programmed test parameters at continuous operation during life testing. This system automatically shuts down a test if any important test parameter deviates from the programmed conditions, or if a bearing failure occurs. A lubrication system was developed as an integral part of the machine, capable of lubricating test bearings by external jets and by means of passages feeding through the spindle and bearing rings into the critical internal bearing surfaces. In addition, provisions were made for controlled oil cooling of inner and outer rings to effect the type of bearing thermal management that is required when testing at high speeds. Author

N74-22149*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF CHROMIUM OXIDE AND MOLYBDENUM DISULFIDE COATINGS IN SELF-ACTING STOPS OF AN AIR-LUBRICATED RAYLEIGH STEP THRUST BEARING
Zolton N. Nemeth Washington NASA May 1974 23 p refs
(NASA-TN-D-7656; E-7777) Avail: NTIS HC $3.00 CSCL 13I

Two coatings for a Rayleigh step thrust bearing were tested when coasting down and stopping under self-acting operation in air. The thrust bearing had an outside diameter of 8.9 cm (3.5 in.), an inside diameter of 5.4 cm (2.1 in.), and nine sectors. The load was 73 N (16.4 lbf). The load pressure was 19.1 kN/per square meter (2.77 lbf/per square inch) on the total thrust bearing area. The chromium oxide coating was good to 150 stops without bearing deterioration, and the molybdenum disulfide coating was good for only four stops before bearing deterioration. The molybdenum disulfide coated bearing failed after nine stops. Author

N74-22150# Sandia Labs., Albuquerque, N.Mex.
MACHINE SHOP PRACTICES FOR OXIDE CERAMIC BISQUE MATERIALS
G. R. Guernsey Nov. 1973 41 p refs Supersedes SC-DR-70-521
(Contract AT(29-1)-789)
(SLA-73-775; SC-DR-70-521) Avail: NTIS HC $4.00

Techniques developed by Sandia Laboratories, Albuquerque, to machine various oxide ceramic bisque materials by using standard machine shop equipment are discussed. Author (NSA)

N74-22151# Bendix Corp., Kansas City, Mo.
INVESTIGATION OF INTERNAL CAVITY PRESSURE AND THICKNESS RESPONSE FOR INJECTION-MOLDED POLYCARBONATES
P. C. Black Nov. 1973 35 p refs
(Contract AT(29-1)-613)
(BDX-613-1002) Avail: NTIS HC $3.75

The internal cavity pressure of an injection mold was evaluated as a controlling variable for the thickness of typical polycarbonate moldings. Mold temperature, melt temperature, and mold-fill mode were evaluated for their effects on molding thickness and thickness runout, designated as the total indicator reading. Author (NSA)

N74-22152# Bendix Corp., Kansas City, Mo.
METHOD OF INSPECTING DIELECTRIC MATERIALS AT MICROWAVE FREQUENCIES
G. D. ODell Nov. 1973 25 p refs
(Contract AT(29-1)-613)
(BDX-613-991) Avail: NTIS HC $3.25

A successful method of screening high-dielectric-constant, nonmagnetic, high-loss-factor materials at microwave frequencies was developed to provide material control by incoming inspection. This is accomplished by measuring the S parameters of the material - reliance on the manufacturer's permittivity data and X-ray examination for voids and inclusions is no longer necessary. Use of an automatic network analyzer makes 100% inspection economically feasible. Author (NSA)

N74-22153# Atomic Energy of Canada Ltd., Chalk River (Ontario).
SUCCESSFUL APPLICATION OF SPIRAL WOUND GASKETS REQUIRES ASME CODE REVISIONS
P. D. Stevens-Guille Aug. 1973 11 p
(AECL-4430) Avail: AEC Depository Libraries HC $3.00; Atomic Energy of Can., Ltd., Chalk River $0.50

Spiral wound gaskets are widely used in piping and pressure vessel construction. However, there is little published data on their characteristics. The ASME Code rules for gaskets contain design data which have not been revised for the last thirty years. Test results and other specification values indicate that they do not reflect current gasket manufacturing practice. Their use can result in designs which provide insufficient bolt area to seat gaskets less than about 5 in. in diameter. Recommended design values are given for gaskets from 2 1/2 to 20 3/4 in. in diameter. In the long term, the ASME Code Subcommittee on Pressure Vessels is encouraged to consider the adoption of the design rules in the German Standard, DIN 2505.
Author (NSA)

N74-22154# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Mecanique.
DESIGN OF A CLASSIFICATION SCHEME FOR MECHANICAL PARTS CENTERED ON FABRICATION GROUP TECHNOLOGY [IMPLANTATION D'UN SYSTEME DE CLASSIFICATION DE PIECES AXE SUR LA FABRICATION TECHNOLOGIE DE GROUPES]
Jacques Peters (Louvain Univ., Belgium), Willy DuMong, and Marc Dieperinck Jan. 1974 137 p refs In FRENCH Sponsored by the Inst. pour l'Encour. de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-MC-49) Avail: NTIS HC $10.00

A classification scheme for mechanical pieces and drawings for production workshops is presented. The encoding system is described based on the OPITZ classification scheme. Its implementation in three workshops is discussed. The information management required is detailed with regard to the information matrices associated with machine tools performance capability. Applications to the choice of a machine tool for a given task is reported together with blueprint classifications. Time aspects are considered in relation to group technology for task preparation, worksheet writing, and work duration estimation. ESRO

N74-22155# Mechanical Technology, Inc., Latham, N.Y.
GAS LUBRICATED FOIL BEARING TECHNOLOGY DEVELOPMENT FOR PROPULSION AND POWER SYSTEMS Final Report, 1 May 1972 - 31 Aug. 1973
Jed A. Walowitt, Sylvester F. Murray, John T. McCabe, Elie B. Arwas, and T. Moyer Dec. 1973 240 p refs
(Contract F33615-72-C-1799; AF Proj. 3048)
(AD-774024; MTI-73TR37; AFAPL-TR-73-92) Avail: NTIS CSCL 13/9

An investigation of air-lubricated foil bearing technology for application in advanced propulsion and power systems was performed. The work conducted under the program comprised: (a) establishment and documentation of the state-of-the-art of foil bearings, (b) development of analytical tools and design guides to permit calculation of the performance of bending-dominated foil bearings, (c) investigation of potential substrate and coating materials, as well as conduct of start-stop and high speed rub tests with two air-lubricated foil bearings at 1000 F, (d) preparation of a layout drawing of a dynamic simulator test vehicle based upon an advanced engine (1980 or later time frame) in the 1000 to 3000 pounds thrust class, as well as a description of the test facility requirements, (e) description of the technology segments of air-lubricated foil bearings that need to be advanced to meet the requirements of the advanced engine application, and definition of the parameters for a long range test effort. (Modified author abstract) GRA

N74-22156# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE TEMPERATURE CONDITIONS FOR THE

FORMATION OF AND THE SERVICE LIFE OF Ni-Cr-Si-B COATINGS
E. A. Antonova, A. A. Appen, and P. S. Andrushchenko 1 Feb. 1974 15 p refs Transl. into ENGLISH from Fiz. Khim. Obrab. Mater. (USSR), no. 5, 1972 p 31-37
(AD-775136; FTD-HT-23-611-74) Avail: NTIS CSCL 11/3

Optimal temperature limits and other conditions are determined for the formation of metal-like coatings of the type Ni-Cr-Si-B on steels by dross technology from the technical powders of the initial elements. Microroentgen spectral analysis is used to determine the distribution of elements Fe, Ni, Cr, Si and B throughout the thickness of the coating and in the boundary layer as a function of firing conditions and the duration of subsequent temperature holding. GRA

N74-22157# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HEAT TREATMENT OF WELDS IN STAINLESS STEEL
G. F. Golovin and E. P. Evangulova 31 Jan. 1974 17 p refs Transl. into ENGLISH from Prom. Primenenie Tokov Vysoko Chastoty, Sb. (Riga), no. 11, 1970 p 106-116
(AD-775096; FTD-HT-23-257-74) Avail: NTIS CSCL 13/8

The study of the possibility of using rapid induction heating for heat treatment of welds in stainless steels of the martensite (4Kh13, 3Kh13) and ferrite (0Kh17T and 0Kh25T) classes was carried out with specimens cut from 2 and 4 mm strip. GRA

N74-22158# Boeing Co., Seattle, Wash. Naval Systems Div.
TRADE-OFF STUDY FOR MATERIALS AND FABRICATION PROCESSES FOR ADVANCED HIGH PERFORMANCE SHIP APPLICATIONS, VOLUME 1 Final Report, 15 Jun. 1973 - 28 Feb. 1974
Thomas J. Bosworth Feb. 1974 235 p refs
(Contract N00024-73-C-5506)
(AD-775330; D180-17941-1-Vol-1) Avail: NTIS CSCL 13/10

The objectives of the study were to: Identify the mission and system criteria for major structural systems for advanced ships; establish guidelines for the selection of materials and processes for high performance ships; conduct trade studies of candidate materials and fabrication processes to evaluate their cost effectiveness and practicality; and, make recommendations for future effort required to fill data voids identified by this study and a plan to accomplish that work. The output of the study includes (1) a list of mission and system criteria that need to be identified prior to the material/fabrication concept selection, (2) a set of guidelines for the selection of material/fabrication concepts applicable to specific mission, system and design criteria, (3) a collection of applicable material and process data, (4) procedures for establishing a fabricability index and a cost index for materials, (5) three trade studies on representative structures, and (6) recommendations for future work. (Modified author abstract) GRA

N74-22159# Boeing Co., Seattle, Wash. Naval Systems Div.
TRADE-OFF STUDY FOR MATERIALS AND FABRICATION PROCESSES FOR ADVANCED HIGH PERFORMANCE SHIP APPLICATIONS. VOLUME 2: APPENDICES Final Report, 15 Jun. 1973 - 28 Feb. 1974
Thomas J. Bosworth Feb. 1974 252 p refs
(Contract N00024-73-C-5506)
(AD-775329; D180-17941-1-Vol-2) Avail: NTIS CSCL 13/10

Supporting appendices are presented for the trade-off study on materials and fabrication processes for advanced high performance ship applications. Author (GRA)

N74-22160# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
ELECTROMECHANICAL MACHINING
R. M. Latanision and K. C. Nielsen May 1973 67 p refs
(Contract DAAF03-72-C-0074)
(AD-774933; RIA-R-RRT-6-35-73) Avail: NTIS CSCL 13/8

The purpose of this investigation was to determine the feasibility of using a new metal cutting process called electromechanical machining in which metal is cut by direct contact of the tool with an electrochemically polarized workpiece. In this process, electrochemical polarization of the workpiece effectively controls the coefficient of friction, between the tool and the workpiece, and the rate of work hardening. Thermoelectric compensation was also used to reduce cutting tool wear while simultaneously investigating electromechanical machining. Electromechanical machining was used in laboratory experiments with polycrystalline nickel and Hastelloy X workpieces. The workpieces were totally submerged in an electrolyte, and a 7-inch shaper was instrumented with strain gages so that forces required in cutting at various electrode potentials could be determined from the tool deflection. (Modified author abstract) GRA

N74-22161# Pennsylvania Univ., Philadelphia.
PROPOSALS FOR INERT GAS TUBE SEALS Final Report
Andrew R. McGhie and John E. Wessel 1973 6 p
(Grant NSF GH-33633)
(PB-224523/1GA; NSF-73-37-GH-33633) Avail: NTIS HC $3.00 CSCL 11A

The principle features of the device are: it is disposable and inexpensive, vessels with large cross sectional areas can be fully used, the system is bakeable, and the sealed tube can be handled in the atmosphere without contamination. GRA

N74-22162# Stanford Univ., Calif. Operations Research House.
ON THE SOLUTION OF LARGE, STRUCTURED LINEAR COMPLEMENTARITY PROBLEMS, 2
Richard S. Sacher Sep. 1973 26 p refs
(Contract N00014-67-A-0112-0011; AT(04-3)-326; NR Proj. 047-064)
(AD-775245; TR-73-5) Avail: NTIS CSCL 12/2

In an earlier paper, R. W. Cottle and the author proposed a special principal pivoting algorithm for a class of large, structured linear complementarity problems. The method was applied with encouraging results to data relating to the free boundary problem for infinite journal bearings. The purpose of the present paper is to compare the empirical performance of the principal pivoting method with that of two other pertinent methods. One of the latter employs LU factorizations and is adaptive in the sense that each iteration exploits the factorization associated with its predecessor. The other is a modification of the point successive overrelaxation technique. Recommendations based on the reported computational experience are made. Author (GRA)

N74-22163# Avco Lycoming Div., Stratford, Conn.
ROLLING ELEMENT BEARING RETAINER ANALYSIS Final Report
Joseph A. Mauriello, Normand Lagasse, A. B. Jones, and William Murray Nov. 1973 267 p refs
(Contract DAAJ02-69-C-0080; DA Proj. 1G1-62203-D-144)
(AD-774264; TR-105-7-10; USAAMRDL-TR-72-45) Avail: NTIS CSCL 13/9

An integrated analytical and experimental program was conducted to analyze the operation of rolling element bearing retainers and attendant lubrication effects. Analytical models to represent ball and roller bearing operation were derived with regard to the elastic deflections at the rolling element/race contacts, tractive forces generated at the bearing component interaction surfaces, and viscous drag effects. (Modified author abstract) GRA

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-22164*# California Univ., Berkeley. Dept. of Electrical Engineering.
STUDY OF EXCITATION TRANSFER IN LASER DYE MIXTURES BY DIRECT MEASUREMENT OF FLUORESCENCE LIFETIME
Chinlon Lin and A. Dienes [1973] 13 p refs
(Grant NGR-05-003-559)
(NASA-CR-138179) Avail: NTIS HC $4.00 CSCL 20E

By directly measuring the donor fluorescence lifetime as a function of acceptor concentration in the laser dye mixture Rhodamine 6G-Cresyl violet, we found that the Stern-Volmer relation is obeyed, from which the rate of excitation transfer is determined. The experimental results indicate that the dominant

mechanism responsible for the efficient excitation transfer is that of resonance transfer due to long range dipole-dipole interaction. Author

N74-22165# Joint Publications Research Service, Arlington, Va.
LASER - 74
N. G. Basov and O. Krokhin 17 Apr. 1974 6 p Transl. into ENGLISH from Izv. (Moscow), 12 Feb. 1974 p 3
(JPRS-61768) Avail: NTIS HC $4.00

Lasers and their use in solving some of the problems in quantum electronics are examined. Specific problems cover optical data processing, laser chemistry, medicine, cutting tools, welding, and electronic equipment manufacturing. Author

N74-22166# RAND Corp., Santa Monica, Calif.
THE CARBON MONOXIDE LASER: A REVIEW
Chuan Cheng Chen Jan. 1974 46 p refs
(P-5163) Avail: NTIS HC $5.50

The development of the carbon monoxide laser is discussed. The various types of continuous wave carbon monoxide lasers are analyzed to show the excitation and inversion mechanisms of the laser. A carbon monoxide gas dynamic laser which is pumped by an electron beam ionizer-sustainer discharge system is described. The principle of anharmonic (V-V) pumping is reported. Mathematical models of the lasing process are included to support the theoretical discussions. The characteristics of the carbon monoxide laser are compared with those of the carbon dioxide laser. Author

N74-22167*# Kanner (Leo) Associates, Redwood City, Calif.
CLASSICAL AND HOLOGRAPHIC GRATINGS. EFFICIENCY PROBLEMS AND THEIR BEARING ON INSTRUMENTAL SPECTROSCOPY
J. Cordelle, J. P. Laude, R. Petit, and G. Pieuchard Washington NASA Jun. 1973 15 p refs Transl. into ENGLISH from Nouv. Rev. d'Optique Appl. (France), v. 1, no. 3, 1970 p 149-154
(Contract NASw-2481)
(NASA-TT-F-14742) Avail: NTIS HC $4.50 CSCL 14E

Previous results concerning metal gratings with a triangular profile are reviewed. Experimental results on the efficiency of holographic gratings are presented to indicate their significance in instrumental spectroscopy. Using classical gratings in Littrow mounting and nonpolarized light, a chart is numerically constructed which permits the determination of the appropriate grating parameters for a given spectroscopic application. Author

N74-22168*# Kanner (Leo) Associates, Redwood City, Calif.
TOWARDS THE THEORETICAL DETERMINATION OF THE OPTIMAL PROFILE OF A HOLOGRAPHIC GRATING
D. Maystre and R. Petit Washington NASA Jun. 1973 8 p refs Transl. into ENGLISH from Opt. Commun. (Netherlands), v. 4, no. 1, Sep. 1971 p 25-28
(Contract NASw-2481)
(NASA-TT-F-14743) Avail: NTIS HC $4.00 CSCL 14E

A mathematical model of the profile for a holographic grating was developed. The solutions attempted are: (1) a series of line segments, (2) a specially designed curve, and (3) a succession of arcs and line segments. Curves are presented to show the efficiencies of various mountings and profiles. The reflecting powers obtained for various mathematical models are analyzed. Author

N74-22169# Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
ON GAS TEMPERATURE IN COAXIAL ELECTRIC DISCHARGE CO2 FLOW LASERS
Josef Shwartz and Eliahu Margalith Dec. 1973 38 p refs
(TAE-191) Avail: NTIS HC $5.00

An analytic and experimental investigation on the dependence of gas temperature on flow and discharge characteristics is presented. The entire range of slow to fast flowing coaxial CO2 electric lasers is considered. At low flow rates the gas temperature is proportional to the electric power input per unit length, while at high flow rates the gas end temperature is proportional to the ratio of total electric power and gas mass flow rate. In addition, gas pressure and entrance Mach number were found to have a noticeable effect on gas temperature: the temperature tends to increase with increasing pressure and to decrease with increasing Mach number. The agreement between theory and experiment is fairly good so that estimates of gas temperature at given flow and discharge conditions can be obtained. Also presented is an experimental correlation between laser power output (or efficiency) and gas temperature. Finally, scaling laws for temperature - limited coaxial flow CO2 electric lasers are proposed. Author

N74-22170*# Scripta Technica, Inc., Washington, D.C.
THE HOLOGRAPHIC GRATING OF THE LYMAN BETA EXPERIMENT OF THE D2A POLAR SATELLITE
J. Desalos, J. Porteneuve, S. Vidal, A. Soufflot, and M. Olivie Washington NASA Jul. 1973 19 p refs Transl. into ENGLISH from unknown French Report, p 155-170
(Contract NASw-2484)
(NASA-TT-F-14727) Avail: NTIS HC $4.00 CSCL 20E

Several solutions are proposed for luminous small-field spectrophotometry at 1025A. The use of a specially designed holographic grating permits adapting it to an imposed geometry. The results obtained are reported. Author

N74-22171*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF HOLOGRAPHIC DIFFRACTION GRATINGS FOR STAR SPECTROSCOPY
Guenter Schmahl Washington NASA Jul. 1973 62 p refs Transl. into ENGLISH of the book "Untersuchungen ueber holographische Beugungsgitter fuer die Sternspektroskopie" Gottingen, Universitaetssternwarte, 1972
(Contract NASw-2481)
(NASA-TT-F-14738) Avail: NTIS HC $6.25 CSCL 20E

A method proposed in 1967 for the holographic production of diffraction gratings with the use of lasers and photoresistant emulsions is summarized along with the experiments carried out in the optical laboratories of the University of Goettingen Observatory. In particular, the accuracy of the interference fields used, the storage medium, the laser used, and the experimental setup are explained. Test results for holographically produced planar reflection gratings up to an edge length of 180 mm, such as are suitable for star spectroscopy, are discussed. Grating size for the Coude spectrographs is also discussed. Author

N74-22172*# Scripta Technica, Inc., Washington, D.C.
ON THE DETERMINATION OF THE FIELD DIFFRACTED BY A HOLOGRAPHIC GRATING
D. Maystre and R. Petit Washington NASA Aug. 1973 6 p refs Transl. into ENGLISH from Opt. Commun. (Netherlands), vol. 2, no. 7, Dec. 1970 309-311
(Contract NASw-2484)
(NASA-TT-F-14747) Avail: NTIS HC $4.00 CSCL 20E

The article deals with the theoretical determination of light efficiencies for holographic gratings. Some numerical results are given to emphasize the influence of grating shape constants. Author

N74-22173*# National Aeronautics and Space Administration, Washington, D.C.
HOLOGRAPHIC DIFFRACTION GRATINGS AND THEIR APPLICATIONS
G. Pieuchard, J. Flamand, J. Cordelle, and A. Labeyrie Sep. 1973 6 p refs Transl. into ENGLISH from Les Appl. de l'Holographie, Comptes Rend. Symp. Intern. (Besancon), Jul. 1970 4 p
(NASA-TT-F-14748) Avail: NTIS HC $4.00 CSCL 20E

The general properties of plane and concave holographic diffraction gratings are reviewed and experimental achievements and possible applications of these optical components are given. Author

N74-22174*# Techtran Corp., Silver Spring, Md.
RECENT PROGRESS IN THE USE OF HOLOGRAPHIC GRATINGS AND SEVERAL OF THEIR APPLICATIONS
G. Pieuchard and J. Flamand Washington NASA Sep. 1973 5 p Transl. into ENGLISH from French report
(Contract NASw-2485)
(NASA-TT-F-14751) Avail: NTIS HC $4.00 CSCL 20E

An experimental study, guided by theoretical considerations,

was made to increase the efficiency of holographic gratings. It was possible to achieve an efficiency of 33% using a grating with 3,600 lines with the Ly alpha line. In addition, flat gratings with 6,000 lines per mm and concave gratings 300 mm in diameter with 1,200 lines per mm were made. Author

N74-22175*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PARAMETRIC THERMODYNAMIC ANALYSIS OF CLOSED-CYCLE GAS-LASER OPERATION IN SPACE
Raymond K. Burns Washington May 1974 59 p refs
(NASA-TN-D-7658; E-7801) Avail: NTIS HC $3.75 CSCL 20E

Cycle efficiency and radiator area required were calculated for thermally and electrically pumped lasers operating in closed cycles with a compressor and the required heat exchangers. A thermally pumped laser included within a Brayton cycle was also analyzed. Performance of all components, including the laser, was parametrically varied. For the thermally pumped laser the cycle efficiencies range below 10 percent and are very sensitive to the high-pressure losses associated with the supersonic diffuser required at the laser cavity exit. The efficiencies predicted for the electrically pumped laser cycles range slightly higher, but radiator area also tends to be larger. Author

N74-22176# Avco-Everett Research Lab., Everett, Mass.
PERFORMANCE CHARACTERISTICS OF A 10 kW INDUSTRIAL CO2 LASER SYSTEM
Ethan Hoag, Henry Pease, John Staal, and Jacob Zar Feb. 1974 27 p refs Presented at the Fourth IEEE-OSA Conf. on Laser Engineering and Appl., Washington, D. C., 30 May - 1 Jun. 1973
(Rept-396) Avail: NTIS HC $4.50

Performance characteristics of an industrial high powered laser system are presented. These include laser gain and laser medium quality measurements which show that the laser system is capable of delivering a 15 kW, near diffraction limited beam to a focal point. A description of this laser system is also given. Author

N74-22177# Sandia Labs., Albuquerque, N.Mex.
DEGENERACY FACTOR IN LASER TRANSITIONS WITH NONDEGENERATE HYPERFINE SPLITTING
R. E. Palmer Oct. 1973 11 p refs
(Contract AT(29-1)-789)
(SLA-73-976) Avail: NTIS HC $3.00

The laser gain equations are investigated in the case where the laser transition is split by the hyperfine interaction into a number of discrete transitions. If relaxation among the hyperfine levels is rapid, then only the strongest transition will lase. Only the upper and lower states directly involved in the transition should be considered in the gain equations. Author (NSA)

N74-22178# California Univ., Livermore. Lawrence Livermore Lab.
DISPERSIVE TEMPORAL COMPRESSION OF LASER PULSES AS AN ALTERNATIVE SOLUTION TO THE SELF-FOCUSING PROBLEM IN LASER AMPLIFIER CHAINS
R. A. Fisher and W. K. Bischel 5 Nov. 1973 39 p refs
(Contract W-7405-eng-48)
(UCID-16405) Avail: NTIS HC $4.00

In response to the discovery of a nonlinear index of refraction D2 in Nd: glass laser media, experimenters have traditionally expanded the beam diameter (and reduced the intensity) to alleviate the self-focusing tendency. It is proposed here to reduce the peak intensity by injecting a lower intensity and longer-duration pulse into the amplifier chain. It is predicted that the glass nonlinearity will impress upon the pulse a chirp suitable for efficient temporal compression. This may result in more efficient laser operation. Related schemes have been used in radar systems. As an example, the evolution of a 1 nsec (full 1/e duration) temporally Gaussian pulse in a 2 m long Nd: glass laser chain was calculated. For a chain averaged intensity of 2 GW/sq cm, one calculates that the pulse could be subsequently compressed (by a series of Gires-Tournois interferometers) to 125 psec with good stability against input pulse amplitude noise. Author (NSA)

N74-22179# Los Alamos Scientific Lab., N.Mex.
SYMMETRY OF LASER-DRIVEN IMPLOSIONS
D. B. Henderson and R. L. Morse Oct. 1973 5 p refs
(Contract W-7405-eng-36)
(LA-5444-MS) Avail: NTIS HC $4.00

The achievement of significant nuclear energy yields from laser-heated pellets of thermonuclear fuel requires that the fuel be compressed to at least several orders of magnitude above initial density. Such compressions can be attained by spherical implosions, but because of the large compression ratios required, these implosions must be highly symmetrical. Calculations of the behavior of imploding spheres and shells by a spherical harmonic perturbation method, and by two-dimensional hydrodynamic codes within their limitations, have shown the importance of electron thermal conduction in the low-density ablation cloud of a pellet in bringing about the required symmetry. These calculations show that, at early time in the heating of a pellet when the ablation cloud is relatively small and cold, the symmetry requirements are most severe and call for as many as four laser beams. However, symmetry requirements at later times, when most of the laser energy must be deposited, may be met by as few as one beam. Author (NSA)

N74-22180# Oak Ridge National Lab., Tenn.
MECHANICAL AND OPTICAL COUPLING OF A THOMPSON SCATTERING LASER T SUB e MEASUREMENT TO THE ORMAK MACHINE
J. S. Culver and M. Murakami 1973 11 p refs Presented at 5th Symp. on Eng. Problems of Fusion Res., Princeton, N. J., 6 Nov. 1973 Sponsored by AEC
(Conf-731114-10) Avail: NTIS HC $3.00

A combination laser, spectrometer device was constructed to observe the electron density and temperature of the ORMAK plasma by Thomson scattering in the range of 50 eV to 2 keV. The apparatus can observe the plasma at six radial positions and fire four 30-ns pulses of Q-switched ruby-laser light during an ORMAK shot. The apparatus and some of its optical components are described. Author (NSA)

N74-22181# Washington Univ., Seattle. Aerospace Research Lab.
INTERACTION OF MAGNETICALLY CONFINED PLASMAS WITH INTENSE RADIATION FROM AN ELECTRON BEAM STABILIZED CO2 LASER Annual Report
G. C. Vlases 1973 27 p refs Sponsored by AEC
(RLO-2225-T-28-1) Avail: NTIS HC $3.50

The development program for the CO2 laser is described. The electron sources, vacuum system, and optical cavities along with some preliminary data are described. Two experiments were proposed. One of them involves irradiating a plasma in a quasi-steady solenoided field, while the other consists of irradiating a pinch plasma under conditions that anomalous backscatter should occur. The progress of these programs is described. NSA

N74-22182# Siemens A.G., Munich (West Germany). Forschungslab.
HIGH POWER CHEMICAL LASERS [CHEMISCHE LASER HOHER LEISTUNG]
Ekkehard Klement and Hans-Hermann White Bonn Bundesmin. fuer Forsch. und Technol. Jan. 1974 48 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FBT-74-01) Avail: NTIS HC $5.50; ZLDI, Munich 9,70 DM

The results of work on high power chemical lasers are reported. An HF laser was constructed with preionization by high energy electrons. The laser has an output energy of 0.18 J/cu cm, with an efficiency of at least 5.5% referred to the electrons reaching the active volume. The relatively low output is due to large losses of electrons dependent on the construction of the electron gun. The dimensions of unstable optical resonators for a CF3J laser were calculated for a number of parameters. Evaported layers of AuV show a reflectivity of 96% at 10.6 micrometer wavelength. They show high hardness, which allows cleaning by wiping with lens cleaning paper, and sufficient resistivity against the gases in the laser tube. ESRO

N74-22183# European Space Research Organization, Paris (France).
THE BASIS OF A RAMAN-LIDAR SYSTEM
Christian Werner Feb. 1974 31 p refs Transl. into ENGLISH of Grundlagen fuer ein Raman-Lidar-System, DLR-MITT-73-19, DFVLR, 1973
(ESRO-TT-21; DLR-MITT-73-19) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 11,20 DM

The system parameters were calculated for a Raman-Lidar system to determine the water vapor/nitrogen mixing ratio remotely in the atmosphere. Extensive calculations, relating to standard distribution of aerosol, nitrogen and water vapor, and taking into account background radiation, led to a system allowing the mixing ratio to be measured continuously over some kilometers in altitude. The extinction of the laser beam has not been accounted for. As this influence is small for the case of simultaneous measurement and formation of the ratio, the mixing ratio can be determined. Absolute measurements of temperature or moisture were found to be erroneous. ESRO

N74-22184# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EMISSION SPECTRUM OF ELECTROIONIZED CO2-LASERS
N. G. Basov, E. M. Belenov, and V. A. Danilychev 4 Feb. 1974 58 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Fiz. Inst. (Moscow), no. 58, 1972 p 1-58
(AD-775146; FTD-MT-24-767-73) Avail: NTIS CSCL 20/5

Contents: Some types of retunable lasers; broadening of spectral lines by pressure; and, experimental installation, obtained results and their discussion. GRA

N74-22185# Hughes Research Labs., Malibu, Calif.
INVESTIGATION OF UV PHOTOIONIZATION SUSTAINED DISCHARGE FOR GAS LASERS Semiannual Technical Report, 1 Jul. - 31 Dec. 1973
Richard C. Lind, W. M. Clark, and J. Y. Wada Mar. 1974 57 p refs
(Contract N00014-73-C-0287; ARPA Order 1807)
(AD-775525) Avail: NTIS CSCL 20/5

The objectives of this program are to investigate and improve ultraviolet (UV) photoionization plasma conditioning techniques, to perform the demonstration of a UV sustained electrical discharge atmospheric pressure CO2 laser, and to establish scalability limits. (Modified author abstract) GRA

N74-22186# Ohio State Univ., Columbus. ElectroScience Lab.
CALCULATED ABSORPTION COEFFICIENTS FOR DF LASER FREQUENCIES
R. K. Long, F. S. Mills, and G. L. Trusty Nov. 1973 79 p refs
(Contract F30602-72-C-0016; ARPA Order 1279; AF Proj. 1279)
(AD-775373; ESL-3271-7; RADC-TR-73-389) Avail: NTIS CSCL 20/6

The report presents calculations of DF laser absorption coefficients for the Mid-Latitude Summer sea level atmospheric model. The individual gases which cause the absorption at each laser wavelength are identified. Results are compared with those previously published by R. A. McClatchey. The calculated results are being used to guide the experimental measurement program. Author (GRA)

N74-22187# United Aircraft Corp., East Hartford, Conn.
EFFECTS OF PARTICULATE MATTER ON ATMOSPHERIC PROPAGATION OF CO2 LASER RADIATION Final Report, 1 Jul. 1972 - 30 Jul. 1973
David C. Smith, Robert T. Brown, Frederick G. Gebhardt, and Paul J. Berger 30 Jul. 1973 64 p refs
(Contract N00014-72-C-0469)
(AD-775221; UARL-M921503-3) Avail: NTIS CSCL 20/6

The influence of aerosols, or particulates, on thermal blooming and gas breakdown of 10.6 micrometer wavelength radiation was measured. When particles are irradiated with high intensity pulsed CO2 laser beams, gas breakdown is initiated and the plasma formed limits the propagation of the beam. Experimental measurements of the threshold for ionization of single particles electrodynamically suspended at the focus of a beam was measured. Streak photographs of the plasma expansion and schlieren studies are also reported. A theoretical analysis of solid particles laser radiation interaction indicates that the mechanism leading to breakdown is superheating of the particle material with subsequent ionization of the solid or of the material directly adjacent to the solid. (Modified author abstract) GRA

N74-22188# Litton Systems, Inc., Morris Plains, N.J. Lambda-Airtron Div.
PREPARATION AND SINGLE CRYSTAL GROWTH OF Li YF 4 LASER MATERIALS Final Report, 1 Jan. - 31 Dec. 1973
Robert Uhrin, Roger F. Belt, Richard C. Puttbach, and Durand R. Kinloch Feb. 1974 38 p refs
(Contract N00014-70-C-0379)
(AD-775211) Avail: NTIS CSCL 20/5

The report describes techniques for preparation of high purity fluorides suitable for laser crystal hosts. Growth methods for Li YF4 were also developed using a constant flow of HF. The YF3 and rare earth fluorides are prepared from 5 or 6-9's polycrystalline oxides. A special platinum reactor was designed to convert oxides to fluorides via an HF reaction. Trifluorides were prepared at 800-900C and melted under HF at 1050-1200C. This prevented formation of oxide and oxyfluoride impurities in the melt. Growth of Li YF4 was accomplished in a resistively heated platinum apparatus and crucible using a modified Czochralski method. Growth occurred under a fixed pressure of HF. Preliminary results gave crystals of high optical quality, free of OH(-), scattering sites, and low impurity level. The procedures should be applicable to other YLF materials in volume production. Author (GRA)

N74-22189# Washington State Univ., Pullman. Dept. of Chemistry.
Q-SWITCHING AND MODE-LOCKING THE Nd(3+)-GLASS LASER WITH THE NICKEL DITHIENES
Douglas Magde, Bruce A. Bushaw, and Maurice W. Windsor Jan. 1974 7 p refs
(AD-775314; TR-2) Avail: NTIS CSCL 20/5

The compound bis-(4-dimethylaminodithiobenzil)-nickel (BDN) was shown to be a photochemically stable saturable absorber suitable as a Q-switch for Nd3--glass lasers. GRA

N74-22190# McDonnell-Douglas Corp., St. Louis, Mo. Radiation Sciences Dept.
LASER KINETIC DATA DEVELOPMENT Final Report, 29 Dec. 1972 - 29 Dec. 1973
Thomas J. Menne 29 Dec. 1973 35 p refs
(Contract DAAH01-73-C-0372)
(AD-774908; MDC-Q0510; RK-CR-73-7) Avail: NTIS CSCL 20/5

The objectives of this contract were to investigate the possibility of a CO chain reaction chemical laser based on O2 - CS chemistry and to model various schemes, particularly gas dynamic expansion, for extracting more power from CO chemical lasers. The direct reaction of O2 - CS was investigated experimentally. Measurements of the vibrational energy distribution of CO from the CS - O2 reaction with a Fabry-Perot microwave resonator/CO chemical laser system were also part of the effort on the first objective. The second effort involved the CO chemical laser modeling code developed under a previous MICOM contract. This computer program was modified to include the cooling effects of gas dynamic expansion through a supersonic nozzle on chemically-formed CO. Both nozzle-cooled and non-nozzle-cooled chemical lasers were modeled. The modeling code was further modified to determine the effect of gas additives on the laser output characteristics. (Modified author abstract) GRA

N74-22191# Army Electronics Command, Fort Monmouth, N.J. 20/5
BEAM QUALITY OF PULSED ORGANIC DYE LASERS
Theodore F. Ewanizky Oct. 1973 32 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-774793; ECOM-4163) Avail: NTIS

Various aspects of flashlamp-pumped organic dye laser efficiency and beam quality are investigated. A coaxial Marx-Bank driver circuit and flashlamp system are described. Shock wave

induced optical distortion in the active solution was identified as a cause for premature laser termination. Beam quality experiments and theoretical analysis indicate that intrinsically strong amplified spontaneous emission effects are responsible for the relatively large beam divergence typically observed in pulsed dye lasers. Flux-injection techniques and mode-locking in dye lasers are discussed as possible remedial measures.
Author (GRA)

N74-22192# Army Electronics Command, Fort Monmouth, N.J.
NUMERICAL ANALYSIS OF A COAXIAL FLASHLAMP - PUMPED RHODAMINE 6G DYE LASER
H. H. Theissing, R. H. Wright, Jr., and T. F. Ewanizky Dec. 1973 44 p refs
(DA Proj. 1T1-61102-B-11A)
(AD-774792; ECOM-4178) Avail: NTIS CSCL 20/5

The coefficients of the laser rate equations describing a pulsed, coaxial flashlamp-pumped organic dye laser, which are not directly accessible, are determined from experimental data, such as, shape of the pump, shape of laser output pulse and energy output of laser at optimum coupling. Computer solutions of the laser rate equations using these coefficients agreed with the experimentally measured laser pulse shape. Also, with the numerical data obtained, an energy balance between spontaneous emission, lost stimulated emission, and useful stimulated emission (laser output) could be established. The effects of amplified spontaneous emission (superradiance) on efficiency and beam quality are discussed. Author (GRA)

N74-22193# Boeing Aerospace Co., Kent, Wash. Laser Physics Lab.
MIXING AND REACTION IN HIGH SPEED H2-F2-DILUENT FLOWS FOR USE WITH SUPERSONIC PULSED HF LASERS Final Report
William J. Thayer, III and J. Doyle McClure Aug. 1973 113 p refs
(Contract N60921-72-C-0356)
(AD-774942; D180-17608-1) Avail: NTIS CSCL 07/4

Rationale for supersonic pulsed chemical lasers and problem areas related to design and use of associated reagent premixers are described. An analytical model of reagent mixing and reaction for evaluation of prereaction and mixing characteristics of high enthalpy H2-F2-diluent flows is formulated and programmed for computer solution. The code is used to evaluate parametric dependence of prereaction level and required mixing length on principal parameters defining candidate premixer flows. Possible flow choking and subsequent detonation in the mixing region resulting from reacting flow transients following a fast laser-reaction pulse are examined, both by defining conditions under which choking by chemical heat addition and/or Chapman-Jouguet detonations are energetically allowed, and by using a simplified reacting flow model to estimate kinetic limitations on probable occurrence of such disturbances. (Modified author abstract)
GRA

N74-22194# United Aircraft Corp., East Hartford, Conn.
HIGH POWER DYE LASERS Annual Report, 1 Jan. 1973 - 28 Feb. 1974
A. R. Clobes, C. M. Ferrar, W. H. Glenn, G. L. Ladd, and W. W. Morey 28 Feb. 1974 80 p refs
(Contract N00014-73-C-0284; ARPA Order 1806)
(AD-775577; UARL-N921617-5) Avail: NTIS CSCL 20/5

The report describes the operation of a high power, repetitively pulsed, flashlamp pumped dye laser. To date an average power of 39 watts at a repetition rate of 100 Hz has been obtained. The techniques employed should be scalable to higher power and higher repetition rate. Experiments to produce frequency sweeping of the laser during the pulse are described. Altimate flashlamp geometries are discussed as are experiments to achieve better spectral matching of the lamp output to the dye.
Author (GRA)

N74-22195# Army Electronics Command, Fort Monmouth, N.J.
THE SPECTRUM OF LASER INDUCED TURBULENCE
Chan Mou Tchen and Edward Collett Feb. 1974 28 p refs
(DA Proj. 1T6-61102-B-53A)
(AD-775409; ECOM-5518) Avail: NTIS CSCL 20/6

The structure of turbulence as induced by the propagation of a high energy laser beam in a fluid is investigated. An analytical theory is developed predicting the spectral laws of temperature fluctuations. The theory involves a hierarchy of equations, which is closed by the method of cascade, as has been developed and applied by Tchen to hydrodynamic and plasma turbulences. The inertia and dissipation subranges are found to follow a modified Kolmogorov law and a modified -13/3 power law, respectively. The critical wavenumber separating the two subranges has been determined to occur at a lower wavenumber than that in the velocity spectrum. In addition, the magnitude of the inertia spectrum is increased by the laser beam as a result of the enhanced conduction. The parameters and the numerical coefficients entering into the spectrum are also determined analytically. Author (GRA)

N74-22196# Naval Ordnance Lab., White Oak, Md.
ABSORPTION OF CO LASER RADIATION BY WATER VAPOR NEAR 5 MICROMETERS
E. L. Harris and W. J. Glowacki 26 Nov. 1973 59 p refs
(AD-774900; NOLTR-73-206) Avail: NTIS CSCL 07/4

Calculations of the absorption of CO laser radiation by water vapor are brought into good agreement with the experimental data by modifying the Lorentz line shape formula. Results of absorption and transmittance calculations made using the modified line shape formula are presented for CO laser lines and other wavelengths near 5 micrometers at various water vapor partial pressures. (Modified author abstract) GRA

N74-22197# United Aircraft Corp., East Hartford, Conn. Research Labs.
RESEARCH INVESTIGATION OF LASER LINE PROFILES (PICOSECOND LASER PULSES) Final Report, 1 Aug. 1966 - 28 Feb. 1974
William H. Glenn 1 Mar. 1974 61 p refs
(Contract N00014-66-C-0344; ARPA Order 1806)
(AD-775576; UARL-N920479-44) Avail: NTIS CSCL 20/6

The report discusses the application of picosecond optical pulses to high resolution imaging optical radar. A novel type of signal processing is described. An extensive bibliography of previous work on this contract is included. Author (GRA)

N74-22198# General Dynamics/Electronics, San Diego, Calif.
MICROWAVE HOLOGRAPHIC ANALYSIS OF CONFORMAL ARRAYS Final Report
R. A. Hayward, E. L. Rope, and G. Tricoles Jan. 1974 52 p refs
(Contract N00019-73-C-0428)
(AD-775327; R73-046-2) Avail: NTIS CSCL 09/5

The report describes the continued development of a holographic method for analyzing the fields near a transmitting array, which may be planar or conformal. The method is also useful for correcting radomes. The method is based on holography, but it differs in the collection and processing of data. The method involves two steps. In the first, phase and intensity are measured on a spherical probing surface. In the second, nearfield distributions are numerically reconstructed from the complex conjugate of the measured data. Numerical reconstruction eliminates scaling limitations that occur when reconstructions are made with visible light. Because reconstructions are computed, the method is flexible. It applies to wide classes of curved arrays because the reconstructed field can be calculated at arbitrary locations. Diverse polarizations can be treated by repeating measurements with two probe orientations. GRA

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-22199 Centre National de la Recherche Scientifique, Odeillo (France). Lab. des Ultra-Refractaires.

INVESTIGATION ON PURE OR COMPLEX GAS-LIQUID OXIDE INTERACTIONS AT HIGH TEMPERATURE Final Report [ETUDE DES INTERACTIONS GAZ-OXYDES LIQUIDES PURS OU COMPLEXES A HAUTE TEMPERATURE]

M. Foex, J. P. Coutures, R. Berjoan, and B. Granier Apr. 1972 15 p refs In FRENCH

(Contract DGRST-69-0-2065)

Avail: Issuing Activity

The interaction between gases and pure or complex liquid refractory oxides of transition elements is presented. The physiochemical phenomena associated with the dissolution of oxygen or nitrogen during the fusion process are investigated with new instrumentation that is described, allowing in situ examination. The aptitude for a given substance to dissolve oxygen when in the liquid phase is discussed by studying the conditions for the dissolution. Special emphasis is given to the behavior of the compounds upon solidification. ESRO

N74-22200*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.

AN INVESTIGATION OF THE PLASTIC FRACTURE OF HIGH STRENGTH STEELS Ph.D. Thesis

T. B. Cox and J. R. Low, Jr. Mar. 1973 202 p refs

(Grant NGR-39-087-003)

(NASA-CR-138162; TR-5) Avail: NTIS HC $13.25 CSCL 11F

Three generally recognized stages of plastic fracture in high strength steels are considered in detail. These stages consist of void initiation, void growth, and void coalescence. A brief review of the existing literature on plastic fracture is included along with an outline of the experimental approach used in the investigation. D.L.G.

N74-22201# National Bureau of Standards, Washington, D.C. Metallurgy Div.

SOFT X-RAY EMISSION SPECTRA OF METALLIC SOLIDS: CRITICAL REVIEW OF SELECTED SYSTEMS AND ANNOTATED SPECTRAL INDEX

A. J. McAllister, R. C. Dobbyn, J. R. Cuthill, and M. L. Williams Jan. 1974 177 p

(NBS-SP-369) Avail: SOD HC $1.85 as C13.10:369

Theory and experimental practice in the field of soft X-ray emission from metallic solids are briefly reviewed, and measurements on a number of systems are critically evaluated and compared with the results of other techniques and theory, with a view to establishing the pertinence of the soft X-ray measurements and indicating specific guidelines for further enhancing their value. In addition, an annotated index of measured spectra is provided. Author

N74-22202*# Manlabs, Inc., Cambridge, Mass.

COMPUTER CALCULATED PHASE DIAGRAMS FOR THE Ni-W-Al, Ni-Al-Hf, Ni-Cr-Hf AND Co(Cr, Ni)-Ta-C SYSTEMS

L. Kaufman and H. Nesor 1 Jan. 1974 65 p refs

(Contract NAS3-17304)

(NASA-CR-134608) Avail: NTIS HC 6.25 CSCL 11D

Computer analysis of the W-Ni, W-Al, Ni-Al, Co-C, Ta-Co, Ta-C, Ta-Ni, Ta-Cr, Hf-Ni, Hf-Al, Hf-Cr, Al-W-Ni, Co-Ta-C, Al-Ni-Hf and Hf-Cr-Ni systems has been carried out in order to predict the isothermal sections and liquidus projections for these systems. The present results indicate that the Al-W-Ni and Hf-Cr-Ni systems offer opportunities for the growth of in-situ composites by means of controlled solidification, while the Al-Ni-Hf system suffers from low melting ternary eutectics. Calculation of the temperature and composition of the Co-TaC eutectic results in reasonable agreement with experimental observations and has been extended to consider effects of nickel and chromium additions on the eutectic temperature and composition. Author

N74-22203*# Martin Marietta Corp., Denver, Colo.

DISSIMILAR METALS JOINT EVALUATION Final Report

Michael E. Wakefield and Leslie E. Apodaca Apr. 1974 120 p

(Contract NAS9-13570)

(NASA-CR-134249; MCR-74-88) Avail: NTIS HC $9.00 CSCL 11F

Dissimilar metals tubular joints between 2219-T851 aluminum alloy and 304L stainless steel were fabricated and tested to evaluate bonding processes. Joints were fabricated by four processes: (1) inertia (friction) weldings, where the metals are spun and forced together to create the weld; (2) explosive welding, where the metals are impacted together at high velocity; (3) co-extrusion, where the metals are extruded in contact at high temperature to promote diffusion; and (4) swaging, where residual stresses in the metals after a stretching operation maintain forced contact in mutual shear areas. Fifteen joints of each type were prepared and evaluated in a 6.35 cm (2.50 in.) O.D. size, with 0.32 cm (0.13 in.) wall thickness, and 7.6 cm (3.0 in) total length. The joints were tested to evaluate their ability to withstand pressure cycle, thermal cycle, galvanic corrosion and burst tests. Leakage tests and other non-destructive test techniques were used to evaluate the behavior of the joints, and the microstructure of the bond areas was analyzed. Author

N74-22204# United Kingdom Atomic Energy Authority, Harwell (England).

METALLURGY DIVISION HIGHLIGHTS Progress Report, Jan. - Dec. 1972

N. H. Hancock, (comp.) Sep. 1973 58 p refs

(AER-PR/Met-7) Avail: AEC Depository Libraries HC $5.00

The report covers four topics, entitled: the fiber composite development laboratory; the development of sodium bonded mixed carbide fuel pins; computer simulation of electron microscope images from crystal defects; developments in the electron probe microanalysis and the scanning electron microscopy of radioactive materials. NSA

N74-22205# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.

AN EXPERIMENTAL INVESTIGATION OF THE EROSIVE CHARACTERISTICS OF 410 STAINLESS STEEL AND 6Al-4V TITANIUM

R. Ball and W. Tabakoff Dec. 1973 32 p refs

(Grant DA-ARO(D)-124-G-154)

(AD-774325; Rept-73-40; AROD-10223-8-E) Avail: NTIS CSCL 11/6

An investigation of the erosive behavior of 410 stainless steel and 6Al-4V titanium was conducted. In the course of this investigation it was found that the velocity dependence of erosion is a function of the impingement angle and the behavior of this dependence varies with different materials. It was also found that the effect of increasing the specimen width is a function of both aerodynamic and material properties, as well as the size of the erodent particle. Grant's model for predicting ductile erosion was investigated for both 410 stainless steel and 6Al-4V titanium. It was found that the model adequately predicts the velocity dependence on both materials above an impingement angle of approximately 15 degrees. Modifications were made in Grant's equation to improve the prediction of the angles of maximum erosion and the shape of the erosion curve. Author (GRA)

N74-22206# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THERMOMECHANICAL TREATMENT OF ALUMINUM ALLOYS

M. Kh. Rabinovich 31 Jan. 1974 192 p refs Transl. into ENGLISH from the monograph "Termomekhanicheskaya Obrabotka Alyuminievykh Splavov" USSR 1972 p 1-161

(AD-775148; FTD-MT-24-834-73) Avail: NTIS CSCL 11/6

In the book an effort is made to generalize accumulated experience on thermomechanical treatment of aluminum alloys. The book outlines methods of combined deformation and heat treatment of aluminum alloys. The book contains 13 tables, 74 figures, and a bibliography of 89 titles. GRA

N74-22207# Battelle Columbus Labs., Ohio.

FAST FRACTURE RESISTANCE AND CRACK ARREST IN STRUCTURAL STEELS Progress Report

G. T. Hahn, R. G. Hoagland, M. F. Kanninen, A. R. Rosenfield, and R. Sejnoha Jun. 1973 131 p refs

(Contract N00024-72-C-5142; SR Proj. 201)

(AD-775018; SSC-242) Avail: NTIS CSCL 11/6

The report presents findings of an Army Research Office supported study concerned with the response of high-strength steels to fast running cracks, and a separate Ship Structure

Committee program dealing with unstable fractures in ship plates. Together, the results provide a new basis for measuring and characterizing the properties of structural alloys that control fast fracture and crack arrest. Measurements and calculations of unstable fracture and fracture arrest in 12.7 mm- and 25.4 mm-thick, high-strength SAE4340 steel and A517F steel plates are described. (Modified author abstract) GRA

N74-22208# National Bureau of Standards, Boulder, Colo. Cryogenic Div.
THERMAL CONDUCTIVITY STANDARD REFERENCE MATERIALS FROM 6 TO 280K. 6: NbS SINTERED TUNGSTEN
J. G. Hurst Jan. 1974 61 p refs
(NBS Proj. 2750295)
(AD-775367; NBSIR-73-351) Avail: NTIS CSCL 20/12

Thermal conductivity, electrical resistivity, Lorenz ratio, and thermopower data are reported for two specimens of NbS sintered tungsten for temperatures from 6 to 280K. Variability of this tungsten was studied by means of electrical resistivity and residual resistivity measurements on 39 specimens. These data indicate a material variability of about plus or minus 10% in thermal conductivity at helium temperatures. Above 90K variation in thermal conductivity is only about plus or minus 1%. To reduce the uncertainty caused by specimen variation at low temperatures, characterization by residual electrical resistivity data is described. By this procedure the low temperature uncertainty is reduced to about plus or minus 3%. Author (GRA)

N74-22209# Midwest Research Inst., Kansas City, Mo.
THE FATIGUE AND IMPACT RESISTANCE OF DUAL-MATRIX BORON-ALUMINUM COMPOSITES Final Report
James R. Hancock and G. Gordon Shaw Feb. 1974 15 p refs
(Contract N00014-70-C-0212; NR Proj. 031-743)
(AD-775334) Avail: NTIS CSCL 11/4

The effects of a soft, plastic interface zone and of heat treatments on the axial fatigue resistance and on the Charpy impact behavior of boron-6061 aluminum composites were determined. Interfacial microstructures and composite fatigue resistance were compared with those previously determined for current, state-of-the-art boron-6061 aluminum composites. It was concluded that (a) matrix crack-tip stresses are relatively unimportant in determining the axial fatigue resistance of boron-aluminum composites, (b) a soft, plastic interface zone will only be effective in improving fatigue resistance in composites with a high-strength metal matrix having poor toughness, and (c) phase-boundary migration into boron filaments may occur during boron-aluminum interdiffusion instead of inert-marker movement into the aluminum matrix. Author (GRA)

N74-22210# Massachusetts Inst. of Tech., Cambridge.
STRUCTURE AND PROPERTY CONTROL THROUGH RAPID QUENCHING OF LIQUID METALS Final Technical Report
N. J. Grant, Regis M. Pelloux, M. C. Flemings, and A. S. Argon 22 Jun. 1973 413 p refs
(Contract DAHC-70-C-0283; ARPA Order 1608)
(AD-775225) Avail: NTIS CSCL 11/6

The report summarizes the results and accomplishments of a three year research program investigating the processing of billets from rapidly quenched liquid metals. Various powder metallurgy (P/M) and quench-casting techniques were employed to generate extremely fine dendrite arm spacings and homogeneous structures. Iron, nickel and cobalt-base alloy powders, produced by steam atmoization (coarse powders), argon atomization, vacuum atomization, and the rotating electrode process, were consolidated into dense billets by hot isostatic pressing (HIP) and/or extrusion. The hot working properties of P/M billets quench-cast bars were evaluated by high strain rate tests and creep (superplastic) testing. Two P/M superalloys, MAR-M-509 (cobalt-base) and IN-100 (nickel-base) after HIP and hot extrusion demonstrated excellent hot workability under high strain rate and creep forming conditions. Detailed analyses of microstructures, heat treatments and mechanical properties are presented for all P/M alloys and compared to equivalent cast materials. Author (GRA)

N74-22211# Rensselaer Polytechnic Inst., Troy, N.Y. Materials Div.
AN ELECTRON MICROSCOPIC EXAMINATION OF PRE-CRACK FATIGUE DAMAGE IN AGE HARDENED Al 5.0 Zn 2.5 Mg
David J. Duquette and Peter R. Swann Feb. 1974 30 p refs
Prepared in cooperation with Imperial Coll. of Science and Technology, London
(Contract N00014-67-A-0117-0012; NR Proj. 036-093)
(AD-775238; TR-3) Avail: NTIS CSCL 11/6

High cycle bending fatigue tests were performed on sheet specimens of an Al, 5.0 w/o Zn, 2.5 w/o Mg alloy. Electron microscopic observations of the free surfaces of the alloy sheets were performed on specimens cycled to crack initiation. These observations showed that low strain fatigue results in the generation of screw dislocations in the vicinity of surface connected grain boundary triple points. As cycling continues, these screw dislocations form jogs which are subsequently pinched off to form sessile edge dislocation loops. It is suggested that crack initiation occurs at a critical dislocation loop density in very narrow slip bands, and that the initiation step is affected by a normal component of stress across the slip plane as a result of dislocation dipole interaction. This normal stress results in a localized cleavage type of failure associated with Stage I cracking in high strength precipitation hardened alloys. (Modified author abstract) GRA

N74-22212# Windsor Univ. (Ontario). Dept. of Physics.
QUENCHING IN COPPER Final Report, 1 Dec. 1972 - 30 Jun. 1973
Lucjan Krause Feb. 1974 67 p refs
(Contract F33615-73-C-1092; AF Proj. 4152)
(AD-775183; AFAL-TR-73-439) Avail: NTIS CSCL 07/4

The purpose of this research was to investigate the quenching of the 4 doublet D(3/2) - 4 doublet D(5/2) states of copper. These are the terminal states involved in the copper laser in which stimulated transitions take place from doublet P to doublet D states. The approach which was adopted involved the introduction into the copper discharge system similar to that employed in the actual laser, another atomic species with resonance states in the vicinity of the Cu states, to which excitation transfer from the doublet D states could easily take place. Such is the case with the resonance states of potassium and of cesium. The seven months over which the contract extended (December 1st 1972 to June 30th 1973) were spent in the design and construction of the experiment and in some preliminary tests of the apparatus and of the discharge. (Modified author abstract) GRA

N74-22213# Titanium Metals Corp. of America, Henderson, Nev.
DEVELOPMENT OF ECONOMICAL SHEET TITANIUM ALLOY Final Report, 10 Apr. 1972 - 10 Nov. 1973
T. L. Wardlaw, H. W. Rosenberg, and W. M. Parris Dec. 1973 249 p refs
(Contract F33615-72-C-1696; AF Proj. 7351)
(AD-775358; AFML-TR-73-296) Avail: NTIS CSCL 11/6

The objective of this program was to develop an economical sheet titanium alloy. The approach was to build on the earlier work with emphasis on mill product economics consistent with formability, fabricability, and other properties required by the ultimate user. Including alloys from the earlier contracts, more than 60 compositions were evaluated. These were narrowed to three final compositions, Ti-8V-7Cr-3Al-4Sn-1Zr, Ti-8V-4Cr-2Mo-2Fe-3Al, and Ti-15V-3Cr-3Al-3Sn. Further work is recommended on all three. Each alloy exhibits good strip producibility potential while meeting the airframe industries: stated cold minimum bend requirements. Each alloy showed Erichsen cup draw depths exceeding 0.35 in. after simulated strip processing to about .040 in. gage. Author (GRA)

N74-22214# California Univ., Berkeley. Dept. of Materials Science and Engineering.
GRAIN REFINEMENT THROUGH THERMAL CYCLING IN AN Fe-Ni-Ti CRYOGENIC ALLOY
S. Jin, J. W. Morris, Jr., and V. F. Zackay Jan. 1974 41 p refs
(Contract N00014-69-A-0200-1062; NR Proj. 031-762)

(AD-775510; TR-3) Avail: NTIS CSCL 11/6

A thermal cycling technique which allows the grain refinement of Fe-12Ni-0.25Ti alloy in four cycles has been developed. The process consists of alternate annealing in gamma range and (alpha - gamma) range with intermediate air cooling. The transformation, microstructures and cryogenic mechanical properties on each cycling step are described. Due to the ultrafine grain size, the ductile-brittle transition temperature of this ferritic alloy in Charpy impact testing was suppressed below 6K. In fracture toughness testing at 77K, the mode of fracture was altered from brittle quasi-cleavage to complete ductile rupture through the grain refining. (Modified author abstract) GRA

N74-22215# Duke Univ., Durham, N.C. Dept. of Civil Engineering.

FATIGUE AND SHAKEDOWN IN METAL MATRIX COMPOSITES Interim Technical Report

George J. Dvorak and J. Q. Tarn Nov. 1973 49 p refs

(Contract DA-ARO(D)-31-124-71-G103)

(AD-775534; Solid-Mechanics-Ser-7; AROD-9570-1-E; ITR-1) Avail: NTIS CSCL 11/4

Simple mechanical models of unidirectional metal matrix composites are used to analyze elastoplastic deformation and shakedown in the matrix under cyclic composite loads. Both axial and off-axis loadings of a lamina are considered. It is shown that the fatigue limits of as-fabricated B-Al, Be-Al, W-Cu, and other composites generally coincide with the composite shakedown limits, because the matrix yield stresses and fatigue limits are equal. In heat-treated composites, the matrix yield stress is usually much higher than the fatigue limit, and matrix fatigue failure can take place in the shakedown state. The residual microstresses caused by heat treatment are estimated, and their influence on fatigue is discussed. A method for improvement of the fatigue resistance of heat-treated composites is proposed. (Modified author abstract) GRA

N74-22216# California Univ., Los Angeles. School of Engineering and Applied Science.

THE USE OF SMALL PRE-CRACKED BEND SPECIMENS FOR QUALITY CONTROL PURPOSES

Alan S. Tetelman, John N. Robinson, and Isaac Roman Nov. 1973 46 p refs

(Contract DAHC04-69-C-0008)

(AD-775395; UCLA-ENG-7383) Avail: NTIS CSCL 11/6

The difficulties involved in using valid ASTM (K sub Ic) specimens for quality control purposes are described. It is shown from tests on steels and titanium alloys that values of (K sub Ic) can be obtained at lower cost from small specimens. If fracture initiation occurs before general yield, (K sub Ic) can be determined from the load required to cause crack extension. If fracture occurs after general yield, (K sub Ic) can be determined from the critical plane strain crack tip opening displacement or from the notch root contraction. The effect of a steeply rising plane strain R-curve can be corrected by using a newly developed R-extrapolation technique. Simplified versions of the methods involved are described whereby small specimens can be used to determine whether a material satisfies specifications for quality control. These simplified versions require little or no calculation for quality control-testing once master nomographs have been drawn up. Author (GRA)

N74-22217# Carnegie-Mellon Univ., Pittsburgh, Pa. Metals Research Lab.

THE EFFECT OF HYDROGEN ON THE DEFORMATION OF IRON

I. M. Bernstein Feb. 1974 15 p refs

(Contract N00014-67-A-0314-0019; NR Proj. 036-099)

(AD-775311; CMU-036-099-1) Avail: NTIS CSCL 11/6

The role of hydrogen on the room temperature deformation behavior of low interstitial and interstitial-free iron has been investigated. Experiments were carried out under dynamic cathodic polarization conditions to maintain a fixed level of dissolved hydrogen. Hydrogen reduces the flow stress relative to hydrogen free iron for all grain sizes in the interstitial-free iron; in the low interstitial iron, hydrogen reduces the flow stress for coarse-grained, while increasing it for fine grained samples. The results are rationalized by the different behavior of hydrogen at grain boundaries and in the lattice, and on the interaction between hydrogen and other solutes. Author (GRA)

N74-22218# Syracuse Univ., N.Y. Dept. of Chemical Engineering and Metallurgy.

REFRACTORY INTERMETALLIC COMPOUND COATINGS Final Report, Jan. 1972 - Jan. 1974

P. J. Ficalora, V. Srikrishnan, and L. Pecora Jan. 1974 20 p refs

(Contract N00017-72-C-4424)

(AD-774893) Avail: NTIS CSCL 11/3

The paper discusses the crystal structure, electronic configuration and thermodynamics of HfPt3 and ZrPt3. On the basis of this research the authors conclude films of HfPt3 and ZrPt3 can be used as coatings for components subjected to high temperature oxidizing atmospheres. GRA

N74-22219# Army Materials and Mechanics Research Center, Watertown, Mass.

STRESS CORROSION CRACKING OF URANIUM ALLOYS Final Report

Walter F. Czyrklis and Milton Levy Dec. 1973 18 p refs

(DA Proj. 1T1-62105-A-349)

(AD-774256; AMMRC-TR-73-54) Avail: NTIS CSCL 11/6

The study was carried out to determine the critical threshold intensity for stress corrosion cracking of several uranium alloys which are candidates for ballistic penetrator and nuclear shell applications. The data reported here are for alloys in the as-extruded condition only and will serve as base-line data for future studies involving the solution-treated-and-aged alloys. GRA

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-22220 Kleber-Colombes (France).

REINFORCEMENT IN COMPOSITE MATERIALS COMPOSED OF ELASTOMERS AND VARIABLE PLASTICITY LOADS Final Report [ETUDE DU RENFORCEMENT DANS LES MATERIAUX COMPOSITES CONSTITUES D'ELASTOMERES ET DE CHARGES A PLASTICITE VARIABLE]

[1973] 27 p refs In FRENCH

(Contract DGRST-71-7-3230)

Avail: Issuing Activity

A study of the reinforcement in elastomers is performed starting from a model composite of glass and Zn spheres dispersed in a SBR. The variable parameters are: size and particle concentration and particle/matrix adhesivity. This last parameter is at a maximum when a coupling agent is introduced: a silane peroxide. For small deformations and dopant content lower than 30% the vulcanizing material modules of elasticity increase depends only on the volumic proportions and follows the law of Guth and Gold. For stronger deformations the reinforcing effect decreases for increasing particle diameter and quantity and also when the coupling particle/matrix is weak. The separation particle/matrix is in anticorrelation with the reinforcing effect. The viscosity increase of the composite is less pronounced than forecasted by the Guth and Gold law. ESRO

N74-22221 Institut Francais de Petrole, Grenoble (France). Dept. de Recherche.

CHEMICAL INVESTIGATIONS ON THE ADHESION OF POLYAMIDES ON INORGANIC AND METALLIC SUBSTRATES IN VIEW OF THE PERFECTION OF NEW ADHESIVES Final Report [RECHERCHES CHIMIQUES SUR L'ADHESIVITE DES POLYAMIDES SUR SUBSTRATS INORGANIQUES ET METAUX EN VUE DE LA MISE AU POINT D'ADHESIFS NOUVEAUX]

J. Nechtschein Feb. 1973 57 p refs In FRENCH

(Contract DGRST-71-7-3106)

(IFP-21-112) Avail: Issuing Activity

The interaction of amides and polyamides with SiO2 and Al2O3 surface was studied by IR spectrography in view of new adhesives manufacturing. The existence of strong hydrogen bonds between the C=O groups of the amides and free OH sites on the SiO2 surface was demonstrated. Substituants influence in the vicinity of the amide bond and the strength of these bonds are well correlated with the Taft constants. Basicity of synthetical polyamides is similar to that of corresponding natural amides. Water resistance and temperature resistance of the bonds is detailed. For Al2O3 the same type hydrogen bonds found in silica was evidenced. The strength of the bonds increases with temperature. A study of the actual surface of Al by multiple reflection was performed and the required experimental conditions are defined. ESRO

N74-22222 Institut National de Recherche Chemique Applique, Paris (France).
CALCULATION DEVELOPMENT AND CHARACTERIZATION OF COMPOSITE STRUCTURES FROM ELEMENTS COMPOSED OF HETEROGENEOUS ORGANIC MATERIALS Final Report [CALCUL, REALISATION ET CARACTERISATION DE STRUCTURES COMPOSITES A PARTIR D'ELEMENTS CONSTITUES EN MATERIAUX ORGANIQUES HETEOROGENES]
G. Mavel, C. Martin, E. Morel, G. Verhcery (Ecole des Mines), B. Drubay (Ecole des Mines), and J. Huneau (Ecole des Mines) Apr. 1973 143 p refs In FRENCH
(Contract DGRST-71-7-3197)
Avail: Issuing Activity

A theoretical and experimental study of the mechanical properties of complex structures using glass or carbon reinforced epoxy resins is presented. The rigidity of beams, the torsional stress of short tubes, and the critical velocity of long tubes are discussed. The comparative shear strength of a composite in plate form or hollow cylinder is discussed. The fatigue resistance of epoxy resin is detailed and improvements by resin flexibilization is discussed. ESRO

N74-22223 Institut National de Recherche Chemique Applique, Paris (France).
FACTORS AND MECHANISMS OF THE ADHESION OF THERMOPLASTIC POLYMERS TO MINERAL REINFORCEMENTS Final Report [FACTEURS ET MECANISMES DE L'ADHESION DES POLYMERS THERMOPLASTIQUES AUX RENFORCEMENTS MINERAUX]
M. Prevost, J. P. DoleRobbe, C. Martin, and E. Morel Mar. 1973 59 p refs In FRENCH
(Contract DGRST-70-0-2176)
Avail: Issuing Activity

The factors and mechanisms for improved adhesion of glass fiber reinforced thermoplastics to the matrix are presented. The adhesion improvement research was carried out on long fibers or on extruded samples with short fibers. The glass fibers were coated with various polymers and copolymers. Technological details are presented. Measurements of the dynamic modules of elasticity, flexibility, torsion stress, and damping were performed with improved accuracy instrumentation of which details are given. Results are presented in the form of tables and graphs. The aging characteristics under various experimental conditions of the laminates are discussed. ESRO

N74-22224*# TRW Systems Group, Redondo Beach, Calif.
FEASIBILITY STUDY FOR THE DEVELOPMENT OF LOW TEMPERATURE CURING ADHESIVES Final Report, 16 May 1973 - 16 Feb. 1974
H. E. Green, J. D. Sutherland, and C. H. Sheppard May 1974 62 p refs
(Contract NAS1-12309)
(NASA-CR-132422; TRW-22743-6009-RU-00) Avail: NTIS HC $6.25 CSCL 11A

The feasibility of a new approach for the development of stable, easily handled, room temperature (293 K - 311 K) curing adhesives was studied and demonstrated. The work concentrated on a family of unsaturated amide/ester resins. Twelve candidate resins were synthesized and tested for completeness of cure at room temperature, adhesion to aluminum and titanium, shear strength, moisture resistance and heat stability. The three most promising candidate resins were selected and recommended for further development. Author

N74-22225*# Southern Research Inst., Birmingham, Ala.
THE THERMAL AND MECHANICAL PROPERTIES OF A LOW-DENSITY GLASS-FIBER-REINFORCED ELASTOMERIC ABLATION MATERIAL
W. T. Engelke, R. W. Robertson, A. L. Bush, and C. D. Pears May 1974 200 p refs
(Contract NAS1-11499)
(NASA-CR-132426) Avail: NTIS HC $13.00 CSCL 11D

An evaluation of the thermal and mechanical properties was performed on a molded low-density elastomeric ablation material designated as Material B. Both the virgin and charred states were examined to provide meaningful inputs to the design of a thermal protection system. Chars representative of the flight chars formed during ablation were prepared in a laboratory furnace from 600 K to 1700 K and properties of effective thermal conductivity, heat capacity, porosity and permeability were determined on the furnace chars formed at various temperature levels within the range. This provided a boxing of the data which will enable the prediction of the transient response of the material during flight ablation. Author

N74-22226*# Sheldahl Co., Northfield, Minn. Advanced Products Div.
INVESTIGATION OF KEVLAR FABRIC BASED MATERIALS FOR USE WITH INFLATABLE STRUCTURES
R. J. Niccum and J. B. Munson Apr. 1974 67 p refs
(Contract NAS1-11694)
(NASA-CR-132411) Avail: NTIS HC $6.50 CSCL 11E

Design, manufacture and testing of laminated and coated composite materials incorporating a structural matrix of Kevlar are reported in detail. The practicality of using Kevlar in aerostat materials is demonstrated and data are provided on practical weaves, lamination and coating particulars, rigidity, strength, weight, elastic coefficients, abrasion resistance, crease effects, peel strength, blocking tendencies, helium permeability, and fabrication techniques. Properties of the Kevlar based materials are compared with conventional, Dacron reinforced counterparts. A comprehensive test and qualification program is discussed and quantitative biaxial tensile and shear test data are provided. The investigation shows that single ply laminates of Kevlar and plastic films offer significant strength to weight improvements, are less permeable than two ply coated materials, but have a lower flex life. Author

N74-22227*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECTS OF PARTICLE SIZE ON THE OPTICAL PROPERTIES AND SURFACE ROUGHNESS OF A GLASS-BALLOON-FILLED BLACK PAINT
Thomas Heslin, James Heaney, and Marvin Harper Washington May 1974 9 p refs
(NASA-TN-D-7643; G-7432; D-7643) Avail: NTIS HC $3.00 CSCL 11C

The effects of particle size on the optical properties and surface roughness of a glass-balloon-filled, carbon-pigmented paint were studied in order to develop a diffuse-reflecting, low-total-reflectance, low-outgassing black paint. Particle sizes ranged between 20 microns and 74 microns. Surface roughness was found to increase with increasing particle size. Relative total reflectance at near-normal incidence (MgO standard) of the filled paints was less than for the unfilled paint between 230 nm and 1800 nm. Total absolute reflectance at 546 nm decreased with increasing particle size at grazing angles of incidence. Near-normal, total emittance was greater for the filled paints than for the unfilled paint. Specularity decreased with increasing particle size over the range studied. Author

N74-22228*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF SIMULATED SPACE ENVIRONMENT ON SKYLAB PARASOL MATERIAL
Wayne S. Slemp Washington May 1974 19 p refs
(NASA-TM-X-2965; L-9344) Avail: NTIS HC $3.00 CSCL 11D

A material consisting of ripstop nylon bonded to the Mylar

side of aluminized Mylar film was used to construct the first Skylab parasol. The mechanical properties of elongation and tensile strength and the radiative properties of solar absorptance and thermal emittance were measured before and after exposure to simulated solar radiation at intensities of 1.0 and 3.5 solar constants for exposure times as long as 947 hours or 3316 equivalent solar hours. The accelerated testing indicated more severe degradation than was experienced in the real-time test (1 solar constant). The results predicted that this material could have given satisfactory performance throughout the planned lifetime of the Skylab workshop. Author

N74-22229# Massachusetts Inst. of Tech., Cambridge.
STUDIES OF THE PROCESSING AND PROPERTIES OF HIGH TEMPERATURE RESIN/GRAPHITE FIBER COMPOSITES Final Report, 9 May 72 - 8 Nov. 73
Nak Ho Sung and Frederick J. McGarry Nov. 1973 72 p refs
(Contract DAAG46-72-C-0163; DA Proj. 1W1-62113-A-660)
(AD-774332; AMMRC-CTR-73-31) Avail: NTIS CSCL 11/4

Comparative studies were made on the fabrication characteristics, room temperature mechanical properties and thermal stabilities of three composite systems based on linear monoether polyphenylquinoxaline (PPQ-O), P13N polyimide and Skybond 703 polyimide, reinforced with Modmor II graphite fibers. Fabrication parameters and prepreg conditions were related to the properties of the laminates fabricated. Interlaminate shear strength, flexural strength and moduli of laminates were evaluated at room temperature. The thermal stability of the composites was studied by measuring the isothermal weight loss at 600F for periods of time up to 500 hours, both in air and in vacuum. Retention of room temperature mechanical properties after thermal aging was evaluated and compared for each laminate system. Author (GRA)

N74-22230# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ADHESION OF EPOXY RESINS TO BASALT FIBERS
G. D. Andreevskaya, Yu. A. Gorbatkins, and I. P. Ladygina 4 Feb. 1974 9 p refs Transl. into ENGLISH from Fiz. Khim. Mekh. Orientirovannykh Stekloplast. (Moscow), 1967 p 80-83
(FTD Proj. T74-01-41)
(AD-775109; FTD-HT-23-797-74) Avail: NTIS CSCL 11/5

Studies of the physicomechanical and adhesive properties of basalt fibers indicated the possibility of using them to obtain reinforced plastics. GRA

N74-22231# Southern Research Inst., Birmingham, Ala.
NONDESTRUCTIVE, THERMAL, AND MECHANICAL PROPERTIES EVALUATIONS OF COMPOSITE HEATSHIELD MATERIALS Final Report, Oct. 1971 - Dec. 1972
James R. Brown, Jr., H. G. Sanders, W. T. Engelke, and C. D. Pears Jan. 1974 719 p refs
(Contract F29601-72-C-0042)
(AD-775364; AFWL-TR-73-189) Avail: NTIS CSCL 11/4

The program involved material property characterization of both Advanced Heatshield Concept Assessment (AHCA) and Advanced Heatshield Program (AHP) materials. The first phase of this work involved nondestructive testing (NDT) characterization and evaluations of tensile, compressive, thermal expansion and thermal conductivity properties of arcs and plates of various AHP composite heatshield materials after simulated nuclear encounter by flyer plate impact. Physical and mechanical properties are presented as a function of the level of impact. A detailed discussion of the distribution of structure-change within the arcs is presented for all materials. The second phase of this work included quality control NDT of rings, arcs, and discs of various AHCA composite heatshield materials and a more extensive NDT characterization of selected rings and arcs from the quality control group. The results of the quality control inspections were also used to select certain rings for application to underground testing. Author (GRA)

N74-22232# Westinghouse Research Labs., Pittsburgh, Pa.
STRONG, HIGH-TEMPERATURE CERAMICS
F. F. Lange 6 Feb. 1974 75 p refs
(Contract N00014-68-C-0323)
(AD-775218; rept-73-9D4-KERAM-P1; TR-11) Avail: NTIS CSCL 11/2

Strong, high-temperature ceramics are defined as those materials that can withstand thermal cycling without failure which is necessary for their use in high temperature structural applications. For this reason, hot-pressed Si3 N4 and SiC are emphasized. The relations between fabrication parameters, microstructure and strength are presented for both materials. Other structural considerations, viz., resistance to thermal shock, impact and oxidation are reviewed. Finally, current directions for obtaining improved and new materials are discussed. Author (GRA)

N74-22233# Tennessee Univ. Space Inst., Tullahoma.
THE MECHANICAL PROPERTIES OF METAL MATRIX COMPOSITES SUBJECTED TO CYCLIC TEMPERATURE CHANGES Annual Report, 1 Jul. 1972 - 30 Jun. 1973
Maurice A. Wright Aug. 1973 105 p refs
(AD-774890) Avail: NTIS CSCL 11/4

The mechanical properties of 6061 aluminum reinforced with fibers of stainless steel, 34 v/o SiC, 27 v/o boron and 45 v/o boron cross-plied 0/90 degrees, were determined in the as-received condition and after thermal fatigue. The properties investigated included longitudinal and transverse strength and modulus, major and minor Poisson's ratio, the density and the fracture toughness. It was concluded that the nature of the damage produced by exposing these materials to cyclic temperature variations consisted of voids and cracks that were solely connected with the matrix or matrix-fiber bond. GRA

N74-22234# Monsanto Research Corp., St. Louis, Mo.
FLOW ORIENTATION OF SHORT FIBERS IN RECTANGULAR CHANNELS
Masaharu Takano Feb. 1974 41 p refs
(Contract N00014-67-C-0218; ARPA Order 876)
(AD-774968; HPC-70-116) Avail: NTIS CSCL 11/4

The effects of fiber concentration, die geometry and flow rate on the fiber behavior and flow properties of concentrated fiber suspensions are observed. The viscosity of resin used in model systems is as low as 55 poises. Rectangular channels are used to eliminate the optical distortion at channel walls. GRA

N74-22235# Pennsylvania State Univ., University Park. Materials Research Lab.
THREE-DIMENSIONAL CHARACTERIZATION OF PARTICLES IN ALUMINA POWDERS BY AUTOMATED SEM (SCANNING ELECTRON MICROSCOPY) ANALYSIS
L. Tarhay, W. R. Buessem, and E. W. White 28 Feb. 1974 26 p refs Presented at the 26th Am. Ceram. Soc. Pacific Cost Regional Meeting, San Francisco, 30 Oct. - 2 Nov. 1973
(Contract N00014-67-A-0385-0019)
(AD-774930; TR-2) Avail: NTIS CSCL 11/2

The paper reports on the recently developed methods for complete morphological particulate characteriization including measurements of particle mass and thickness together with the usual microscope parameters of projected area and shape. The method is based on computer evaluation of scanning electron microscope images which renders the analysis particle by particle. Nine commercially available aluminas have been characterized by this method. Statistical characteristics are compared with special emphasis on a 'tabularity index', which results from a mathematical evaluation of the correlation between the directly measured particle mass and the particle volume computed from the microscope equivalent circular diameter. Author (GRA)

N74-22236# Solar, San Diego, Calif.
STATIC FATIGUE OF CERAMIC MATERIALS Technical Report, 1 Apr. 1973 - 31 Jan. 1974
Mary E. Gulden and Arthur G. Metcalfe Feb. 1974 22 p refs
(Contract N00014-73-C-0401; NR Proj. 032-542)
(AD-774934; RDR-1778-1) Avail: NTIS CSCL 11/2

Time-dependent failure in the temperature range zero to 900C of four ceramic materials is being studied by four-point bend testing at different strain rates. The standard environment for testing is water-saturated air at room temperature. The materials are sapphire, Wesgo Al 995 alumina, Norton NC-132 hot-pressed silicon nitride, and Norton NC-350 reaction-sintered silicon nitride. The purpose of the investigation is to identify the temperature range where static fatigue phenomena are important and

subsequently to identify the moisture related stress corrosion processes which occur. Variable strain rate tests at different humidities indicated this time-dependent failure was moisture related. (Modified author abstract) GRA

N74-22237# Ministry of Defence, London (England).
EVALUATION OF HIGH TEMPERATURE-RESISTANT COATINGS FOR THE PROTECTION OF MAGNESIUM ALLOYS
K. G. Adamson, J. F. King, and W. Unsworth Jul. 1973 36 p
(AD-775200; D-MAT-196; BR38312) Avail: NTIS CSCL 11/2

A number of commercially available high temperature resistant coatings have been evaluated by subjecting them to temperatures up to 350C for periods up to 1,000 hours, followed by exposure to corrosion tests. Only two paints, showed any degree of temperature resistance at 350C. The thermal stability of the polyimide coatings was good, but they failed due to their lack of adhesion to the chrome manganese film after exposures longer than 100 hours at 300C. (Modified author abstract) GRA

N74-22238# Ministry of Defence, London (England).
IMPREGNATION OF ANODIC FILMS FOR THE PROTECTION OF MAGNESIUM ALLOYS
J. F. King, K. G. Adamson, and W. Unsworth Feb. 1973 36 p ref
(AD-775198; D-MAT-193; BR38303) Avail: NTIS CSCL 11/3

The resin impregnation of Dow 17 and H.A.E. anodic films on magnesium alloys has been investigated. A number of solvent free and solvent containing resins have been evaluated using dip and vacuum impregnation techniques. It was possible to effectively impregnate anodic films with a number of resins using a simple dip technique, but epoxy resins, particularly Araldite 985E gave the best corrosion protection. It is believed that a cost saving could be obtained by substituting a simple anodising-impregnating process for the rather lengthy and expensive surface sealing procedure of DTD 911C, although the impregnated anodic film may not be universally applicable. In close tolerance areas where very thin resin coats may be applied according to DTD 911C, coatings less than 0.001 ins. thick would not be possible with impregnated anodic films. This would necessitate masking during anodising, with consequently less cost saving. (Modified author abstract) GRA

N74-22239# Ministry of Defence, London (England).
EVALUATION OF THE DOW 17 TREATMENT FOR MAGNESIUM ALLOYS
K. G. Adamson, J. F. King, and W. Unsworth Feb. 1973 44 p
(AD-775197; D-MAT-192; BR38304) Avail: NTIS CSCL 11/3

The purpose of this investigation was to study the Dow 17 process and evaluate the coating in comparison with equivalent currently used pretreatments. The following main areas were investigated: Investigation of operating parameters of the Dow 17 bath; comparison of Dow 17 treatments with the DTD 911C required pretreatment; Comparison of various currently used protective systems based on Dow 17 with DTD 911C procedure; comparison of fatigue properties after Dow 17 treatments. GRA

N74-22240# Army Materials and Mechanics Research Center, Watertown, Mass.
FRACTURE CHARACTERISTICS OF BORON FIBER-REINFORCED ALUMINUM 2024 AS DETECTED BY ACOUSTIC EMISSION Final Technical Report
Albert F. Grenis and Francis J. Rudy Dec. 1973 16 p
(DA Proj. 1T0-62105-A-349)
(AD-774816; AMMRC-TR-73-57) Avail: NTIS CSCL 11/4

Results of experimental studies using acoustic emission techniques with aluminum 2024 and with boron fiber-reinforced aluminum 2024 are discussed. Since the stress-strain relationship for the composite before fracture was also recorded, it was possible to detect that region (strain) where significant fiber fracture began for a particular composite specimen. Emphasis was on the study of the characteristics of fiber fracture rather than on determining the ultimate strength of the composite. Author (GRA)

N74-22241# Monsanto Research Corp., St. Louis, Mo.
THE EFFECT OF STRESS ON DIFFUSION IN COMPOSITES OBSERVATIONS
D. C. Ruhmann and E. M. Wu 1 Feb. 1974 21 p
(Contract N00014-67-C-0218; ARPA Order 876)
(AD-774964; HPC-73-162) Avail: NTIS CSCL 11/4

An investigation was made of the effect of anisotropy on the sorption characteristics of benzene by a glass-epoxy composite material system. The work was conducted in three phases; the first being the characterization of the sorption of benzene by the homogeneous epoxy matrix; the second, an experimental study of the effect of anisotropy resulting from the unidirectional glass filaments on the sorption characteristics; the third, an experimental investigation into the role internal stresses generated as a result of the dilatation which accompanies the sorption of the organic solvent have in determining the response of the material system to the presence of the solvent. GRA

N74-22242# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELASTIC CONSTANTS OF STOCHASTICALLY REINFORCED MATERIALS
G. N. Savin and L. P. Khoroshun 31 Jan. 1974 16 p refs
Transl. into ENGLISH from the monograph "Mekhanika Sploshnoi Sredy i Rodstvennye Problemy Analiza" Leningrad, 1972 p 437-444
(AD-775117; FTD-HT-23-340-74) Avail: NTIS CSCL 11/4

The theory of random functions was used to determine the macroscopic elastic constants of stochastically reinforced materials as well as to study their dependence on the corresponding constants of the components, their pre-volume concentrations, and their form of reinforcements. E.H.W.

N74-22243# TRW, Inc., Cleveland, Ohio.
THE MECHANICAL BEHAVIOR OF METAL MATRIX COMPOSITES Final Report, 1 Apr. 1972 - 30 Apr. 1973
Scott Scheirer, T. and Istvan J. Toth May 1973 92 p refs
(Contract F33615-72-C-1601; AF Proj. 7351)
(AD-775359; TRW-ER-7274-9; AFML-TR-73-178) Avail: NTIS CSCL 11/4

A study of certain factors influencing tensile, fatigue, and creep behavior in B-Al and B/SiC-Ti composite materials was performed. The effects of controlled composite imperfections (including filament spacing defects, aligned filament breakage, and improper fiber-matrix bond condition) on tensile and fatigue behavior were investigated. Fatigue behavior of B/SiC-Ti was studied for a variety of loading conditions. (Modified author abstract) GRA

N74-22244# Tel-Aviv Univ. (Israel). School of Engineering.
A NUMERICAL SOLUTION FOR THE PROBLEM OF AN IMPACTED FIBER-REINFORCED VISCOELASTIC HALF-SPACE
Jacob Aboudi and Yechiel Weitsman Feb. 1973 36 p refs
(Grant AF-AFOSR-2143-71; AF Proj. 9782)
(AD-775046; TAU-SOE-72/73; AFOSR-74-0041TR) Avail: NTIS CSCL 11/4

The response of a time-dependent external load of a viscoelastic half-space reinforced by oblique elastic fibers is obtained. The viscoelastic matrix is assumed to be described by any model of viscoelasticity and the fibers are allowed to occupy arbitrary volume within the matrix and to possess any elastic moduli. A numerical method of solution is presented together with its stability and convergence, and the accuracy of the results are examined. Author (GRA)

N74-22245# Martin Marietta Corp., Baltimore, Md.
GLASS FRACTURE CHEMISTRY Final Report, Apr. 1970 - Dec. 1973
Albert R. C. Westwood, William M. Mularie, and Norman H. MacMillan Dec. 1973 88 p refs
(Contract N00014-70-C-0330; NR Proj. 032-524)
(AD-775001; MML-TR-74-08-C) Avail: NTIS CSCL 11/2

The report summarizes results of research carried out under the Contract. Topics discussed include (1) the provision of evidence for a direct correlation between environment-sensitive surface potential and the mobility of near-surface dislocations in MgO, (2) chemomechanical control of sliding friction behavior in MgO

and soda lime glass, (3) the role of environment-dependent surface potential in determining the propagation behavior of sub-critical cracks in soda lime glass. Technical reports and publications resulting from this contract also are listed. (Modified author abstract) GRA

N74-22246# Army Foreign Science and Technology Center, Charlottesville, Va.
PROGRESS IN SOVIET SCIENCE. SOME CONTRIBUTIONS OF A. A. ILYUSHIN TO MECHANICS OF POLYMERS, WITH COMMENTARY BY DR. ROY H. GEISS Special Purpose Document No. 5
A. A. Ilyushin and Roy H. Geiss Dec. 1972 101 p refs Transl. into ENGLISH from various Russian Journals
(AD-775398; FSTC-CW-01-05-73) Avail: NTIS CSCL 11/9

A brief review is given of Russian approach to elasticity fundamentals, with reference to the expansion of stress and strain tensors into deviators and spherical tensors. A. A. Ilyushin's contribution to viscoelasticity using these concepts are given along with several of his papers in this area. A biography and bibliography of Ilyushin are also included. GRA

N74-22247# Purdue Univ., Lafayette, Ind. Thermophysical Properties Research Center.
THERMOPHYSICAL AND ELECTRONIC PROPERTIES INFORMATION ANALYSIS CENTER (TEPIAC): A SYSTEMATIC PROGRAM ON TABLES OF THERMOPHYSICAL AND ELECTRONIC PROPERTIES OF MATERIALS Final Report, 1 Oct. 1972 - 7 Oct. 1973
Cho Yen Ho Jan. 1974 206 p refs
(Contract DSA900-73-C-2101)
(AD-774852; AMMRC-CTR-74-4) Avail: NTIS CSCL 07/4

The Final Report describes the activities and accomplishments of the Thermophysical and Electronic Properties Information Analysis Center (TEPIAC), which comprises internally the Thermophysical Properties Information Analysis Center (TPIAC) and the Electronic Properties Information Center (EPIC). TEPIAC's activities reported herein include literature search, acquisition, review, and codification; substance classification and organization; operation of a computerized information storage and retrieval system; publication of the Thermophysical Properties Research Literature Retrieval Guide Supplement; data extraction and compilation; data evaluation, correlation, analysis, synthesis, and generation of recommended reference values; publication of the TPRC Data Series, state-of-the-art summaries, and critical reviews; technical and bibliographic inquiry services; and current awareness and promotion efforts. TPIAC covers 14 thermophysical properties of all matter at all temperatures. EPIC covers 22 electronic (including also electrical, magnetic, and optical) properties and property groups of selected material groups at all temperatures. (Modified author abstract) GRA

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-22248# Manchester Univ. (England). Statistical Lab.
A QUICKEST DETECTION PROBLEM WITH COSTLY INFORMATION
D. Balmer Dec. 1973 20 p refs Prepared in cooperation with Salford Univ.
(RR-46/DB/1) Avail: NTIS HC $4.00

Problems of detecting the arrival of a disorder are of central importance in quality control. One such problem is formulated as an optimal stopping problem in which information about the process to be stopped may be bought at any time. A control policy involves a determination of times at which information should be bought and of the time at which the process should be stopped. It is shown that in all circumstances there is a unique policy, satisfying necessary conditions for optimality; the various circumstances and control policies are specified. Author

N74-22249# Manchester Univ. (England). Statistical Lab.
ASYMPTOTIC PROPERTIES OF SUPERCRITICAL BRANCHING PROCESSES. 1: THE GALTON-WATSON PROCESS
N. H. Bingham (Westfield Coll., London) and R. A. Doney Feb. 1974 33 p refs
(RR-47/RAD/4) Avail: NTIS HC $4.75

The results connecting the distributions of random variables in the supercritical Galton-Watson process are discussed. Results are included relating tail-behavior of a probability measure to the behavior of its Laplace-Stieltjes transform near the origin. Author

N74-22250*# North Carolina State Univ., Raleigh. Dept. of Mathematics.
CALCULUS OF VARIATIONS AND MATHEMATICAL THEORY OF OPTIMAL CONTROL Final Report, 15 Sep. 1965 - 15 Mar. 1974
Hans Sagan 15 Mar. 1974 3 p refs
(Grant NGL-34-002-032)
(NASA-CR-138109) Avail: NTIS HC $4.00 CSCL 12A

A bibliography is presented of publications and reports resulting from the research project. D.L.G.

N74-22251# RAND Corp., Santa Monica, Calif.
A SURVEY OF SOLUTION CONCEPTS FOR MAJORITY RULE GAMES
Robert Shishko Jan. 1974 34 p refs Revised
(P-5169-Rev) Avail: NTIS HC $4.75

Game-theoretic solution concepts applicable to n-person majority rule games are presented. An n-person cooperative game, (N, v), is called a C-game if it can be adequately represented by its characteristic function, v. Side payments are permitted if an infinitely divisible store of value can be transferred between players before or after the game is played. Finally, utility is said to be transferable if the transfer of the story of value causes the recipient's utility to change at a constant marginal rate proportional to the amount transferred. Author

N74-22252*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A GENERAL FORM OF THE CO-MOVING TENSORIAL DERIVATIVE
Earle K. Huckins, III and Richard E. Turner Washington May 1974 28 p refs
(NASA-TN-D-7464; L-9136) Avail: NTIS HC $3.25 CSCL 12A

A general expression for the co-moving derivative of a tensor is derived. A variable describing the coordinate velocity field is introduced. Time dependency of the metric elements is expressed in terms of this velocity field. The resulting description of motion is one of which the Eulerian and Lagrangian viewpoints are special cases. This general description is useful in problems involving moving boundaries or discontinuities. Author

N74-22253# Manchester Univ. (England). Statistical Lab.
OPTIMAL CONTROL OF STATIONARY MARKOV PROCESSES
R. Morton Aug. 1972 19 p refs
(RR-37/RM/5) Avail: NTIS HC $4.00

Optimal control of Markov processes when the control policy is stationary and the process possesses a stationary distribution are discussed. The costs are unbounded and additive, and may or may not be discounted. Applications to Semi-Markov processes are included, and the results for random walks are related to diffusion processes. Author

N74-22254# Manchester Univ. (England). Statistical Lab.
ON THE EXISTENCE AND UNIQUENESS OF ROOTS OF MARKOV SHIFTS
S. M. Rudolfer Jul. 1973 17 p refs
(RR-43/SMR/3) Avail: NTIS HC $4.00

Let T be a Bernoulli shift. For each r = 2,3,... it is shown that all rth roots of T are isomorphic. It is shown that an irreducible Markov shift T sub V of period V Greater than or equal to 1 has an (essentially unique) rth root precisely when r and v are relatively prime. This result is generalised to reducible Markov shifts, whose metric conjugacy classes are described. Author

N74-22255# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

A METHOD FOR UNBIASED PARAMETER ESTIMATION BY MEANS OF THE EQUATION ERROR INPUT COVARIANCE
S. J. Merhav and E. Gabay Jan. 1974 22 p refs
(TAE-194) Avail: NTIS HC $4.25

A method for obtaining a unique and unbiased estimate of an r-dimensional parameter vector in open or closed loop linear systems in the presence of noise is described. The method is based on the equation error and is presented in continuous time. Instead of the classical least squares approach, the equation error is correlated with the input and the covariance is equated to zero. The resulting single linear equation in the r unknown parameters provides a necessary condition for their unique identification. From it, r - 1 additional independent equations are generated. The resulting r linear equations provide the unbiased estimate of the parameter vector. The method does not require the identification of the noise statistics and no precise knowledge of the form and order of the system is required. Implementation is indicated in hybrid analog-digital form. The method is illustrated by numerical examples. Author

N74-22256# Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
UNBIASED PARAMETER ESTIMATION BY MEANS OF AUTOCORRELATION FUNCTIONS
S. J. Merhav and E. Gabay Dec. 1973 27 p refs
(TAE-190) Avail: NTIS HC $4.50

A method for obtaining on line unbiased parameter estimates of linear systems in the presence of additive uncorrelated noise is described. The method is based on the equation error and is presented in the form of continuous variables. Instead of the conventional approach of least squares, the autocorrelation function of the error is chosen as the cost function to be minimized. It is shown that for comparatively wide band noise, this cost function yields practically unbiased estimates. The solution of the estimate retains the main advantages of the equation error, i.e., uniqueness and, often, asymptotic stability. On line identification from system input and output is feasible both in open and closed loop. The method is illustrated by numerical examples. Author

N74-22257# Manchester Univ. (England). Statistical Lab.
ON ERGODIC AUTOMORPHISMS OF A SOLENOID
S. M. Rudolfer and A. M. Wilson Jan. 1974 19 p refs
(RR-45/SMR/4/AW/1) Avail: NTIS HC $4.00

A Bernoulli generator is constructed for ergodic automorphisms of certain solenoids. An arbitrary ergodic automorphism of a solenoid is obtained as an increasing union of such automorphisms, and an application of a theorem leads to a proof of the following result: an ergodic automorphism of a solenoid is a Bernoulli shift. Author

N74-22258*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN EXTENSION OF THE LAPLACE TRANSFORM TO SCHWARTZ DISTRIBUTIONS
Douglas R. Price Washington May 1974 65 p refs
(NASA-TR-R-420; L-9234) Avail: NTIS HC $3.75 CSCL 12A

A characterization of the Laplace transform is developed which extends the transform to the Schwartz distributions. The class of distributions includes the impulse functions and other singular functions which occur as solutions to ordinary and partial differential equations. The standard theorems on analyticity, uniqueness, and invertibility of the transform are proved by using the characterization as the definition of the Laplace transform. The definition uses sequences of linear transformations on the space of distributions which extends the Laplace transform to another class of generalized functions, the Mikusinski operators. It is shown that the sequential definition of the transform is equivalent to Schwartz' extension of the ordinary Laplace transform to distributions but, in contrast to Schwartz' definition, does not use the distributional Fourier transform. Several theorems concerning the particular linear transformations used to define the Laplace transforms are proved. All the results proved in one dimension are extended to the n-dimensional case, but proofs are presented only for those situations that require methods different from their one-dimensional analogs. Author

N74-22259# Illinois Univ., Urbana. Coordinated Science Lab.
THE RELATION OF EQUIVALENCE FOR POST ALGEBRAS AND ITS APPLICATION TO HAZARD-FREE IMPLEMENTATIONS OF BOOLEAN FUNCTIONS Ph.D. Thesis
Edgar George Ducasse Aug. 1973 161 p refs
(Contract DAAB07-72-C-0259; Grant NSF GK-15459)
(AD-774371; R-618; UILU-ENG-73-2220) Avail: NTIS CSCL 12/1

The investigation encompasses the study of elementary properties of Post algebras, as well as the development of a useful theory of equivalence for elements of an arbitrary Post algebra. The characteristics of finite Post algebras are detailed, and an application to the computation of function values in these lattices is presented. Several known theorems concerning particular classes of Post functions are extended, and new results are established. (Modified author abstract) GRA

N74-22260# Stanford Univ., Calif.
ASYMPTOTIC PROPERTIES AND COMPUTATION OF MAXIMUM LIKELIHOOD ESTIMATES IN THE MIXED MODEL OF THE ANALYSIS OF VARIANCE
John James Miller 21 Nov. 1973 276 p refs
(Contract N00014-67-A-0112-0030; NR Proj. 042-034)
(AD-775399; TR-12) Avail: NTIS CSCL 12/1

The problem considered is the estimation of the parameters in the mixed model of the analysis of variance, assuming normality of the random effects and errors. Both asymptotic properties of such estimates as the size of the design increases and numerical procedures for their calculation are discussed. Estimation is carried out by the method of maximum likelihood. It is shown that there is a sequence of roots of the likelihood equations which is consistent, asymptotically normal and asymptotically efficient in the sense of attaining the Cramer-Rao lower bound for the covariance matrix as the size of the design increases. This is accomplished using a Taylor series expansion of the log-likelihood. (Modified author abstract) GRA

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-22261 Electricite de France, Paris. Div. Echanges Atmospheriques.
METHODOLOGIC INVESTIGATION OF ATMOSPHERIC POLLUTION DIFFUSION CONDITIONS IN VIEW OF THE DEVELOPMENT OF A PRAGMATIC MODEL FOR THE PREDICTION OF POLLUTION Final Report [RECHERCHE METHODOLOGIQUE DES CONDITIONS DE DIFFUSION DE LA POLLUTION EN VUE DE L'ELABORATION D'UN MODELE PRAGMATIQUE DE PREVISION DE LA POLLUTION]
M. Jacquet Dec. 1972 36 p In FRENCH
(Contract DGRST-69-0-1757)
Avail: Issuing Activity

Pollution diffusion conditions relating to a pragmatic model for pollution forecasting are studied. An experimental meteorology and aeronomy station was used to define a methodology comprising ground and low altitude measurements, radiosondes, and balloon sounding. The measurement of pollution in the vicinity of a fuel oil electric power plant was performed permitting statistics to be analyzed with parameters including fuel oil influence, diffusion conditions as a function of seasonal variations, aerological stability of the lower atmosphere, and fine structure of wind profiles. Critical examination of the methodology was carried out and indications are given on mecanographic data reduction. ESRO

N74-22262 Direction de la Meteorologie Nationale, Paris (France).
ELECTRONIC COMPUTATION SET OF THE METEOROLOGIE NATIONALE Final Report [ENSEMBLE ELECTRONIQUE DE CALCUL DE LA METEOROLOGIE NATIONALE COMPUTE RENDU DE FIN DE CONTRAT]
Mar. 1973 18 p refs In FRENCH
(Contract DGRST-67-0-0936)

Avail: Issuing Activity

The activities of the data reduction center of the French meteorological office are presented. Fast algorithms based on spectral models were applied to macroscopic atmospherical dynamics and energetics. A general treatment of macroturbulences was developed and applied to the limit layer. A numerical dynamic atmospheric model taking into account the influence of various local and regional parameters was set up for numerical weather forecasting. Meteorological fields at ocean surface were used to define mathematical models of ocean wave fields and surface marine temperatures. Hydrodynamic numerical models based on vortex theory were developed to describe wave genesis and evolution. A set of programs for data processing of meteorological observations, analysis, and hemispherical field forecast was developed in correspondence with a six level primitive equations model. ESRO

N74-22263# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.
MONITORING AND AIR QUALITY TRENDS REPORT, 1972
Dec. 1973 222 p refs
(EPA-450/1-73-004) Avail: NTIS HC $14.00

A comprehensive tabulation of the nation's air quality and monitoring activities for 1972 are presented. Its findings are based on extensive monitoring activities conducted by Federal, State, and local air pollution control agencies organized within established Air Quality Control Regions. Information is provided for four of the five pollutants for which National Ambient Air Quality Standards (NAAQS) have been set. In addition, an analysis of the trends of CO, oxidants, and NO2 are presented for selected AQCR's. A discussion of the trends in sulfate concentrations at National Aerometric Surveillance Network stations is included along with an update for 1972 of the previously published analysis of TSP and SO2. Author

N74-22264# Environmental Data Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, DECEMBER 1973
Key to Meteorological Records Documentation No. 5.4
Mar. 1974 98 p refs
Avail: NTIS HC $8.00

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths by a scanning radiometer on the NOAA 2 satellite. Author

N74-22265# Environmental Data Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, JANUARY 1974
Key to Meteorological Records Documentation No. 5.4
Apr. 1974 98 p refs
Avail: NTIS HC $8.00

For abstract, see N74-22264.

N74-22266# Environmental Data Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, FEBRUARY 1974
Key to Meteorological Records Documentation No. 5.4
Apr. 1974 89 p refs
Avail: NTIS HC $7.50

For abstract, see N74-22264.

N74-22267*# Wisconsin Univ., Madison. Space Science and Engineering Center.
MULTIDISCIPLINARY STUDIES OF THE SOCIAL, ECONOMIC AND POLITICAL IMPACT RESULTING FROM RECENT ADVANCES IN SATELLITE METEOROLOGY, VOLUME 5
Interim Report
Nov. 1973 283 p refs
(Grant NGL-50-002-114)
(NASA-CR-138155) Avail: NTIS HC $17.25 CSCL 04B

Studies are presented on mesoscale weather monitoring, analysis, and dissemination of weather forecasts for the Wisconsin area. For individual titles, see N74-22268 through N74-22273.

N74-22268* Wisconsin Univ., Madison.
IMPACT OF NOWCASTING ON THE PRODUCTION AND PROCESSING OF AGRICULTURAL CROPS
W. S. Dancer and T. W. Tibbitts *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorology, Vol. 5 Nov. 1973 p 1-47 refs (For availability see N74-22267 13-20)
CSCL 04B

The value was studied of improved weather information and weather forecasting to farmers, growers, and agricultural processing industries in the United States. The study was undertaken to identify the production and processing operations that could be improved with accurate and timely information on changing weather patterns. Estimates were then made of the potential savings that could be realized with accurate information about the prevailing weather and short term forecasts for up to 12 hours. This weather information has been termed nowcasting. The growing, marketing, and processing operations of the twenty most valuable crops in the United States were studied to determine those operations that are sensitive to short-term weather forecasting. Agricultural extension specialists, research scientists, growers, and representatives of processing industries were consulted and interviewed. The value of the crops included in this survey and their production levels are given. The total value for crops surveyed exceeds 24 billion dollars and represents more than 92 percent of total U.S. crop value. Author

N74-22269* Wisconsin Univ., Madison.
BROADCAST MEDIA AND THE DISSEMINATION OF WEATHER INFORMATION
James Byrnes *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorology, Vol. 5 Nov. 1973 p 48-87 refs (For availability see N74-22267 13-20)
CSCL 04B

Although television is the public's most preferred source of weather information, it fails to provide weather reports to those groups who seek the information early in the day and during the day. The result is that many people most often use radio as a source of information, yet preferring the medium of television. The public actively seeks weather information from both radio and TV stations, usually seeking information on current conditions and short range forecasts. forecasts. Nearly all broadcast stations surveyed were eager to air severe weather bulletins quickly and often. Interest in Nowcasting was high among radio and TV broadcasters, with a significant portion indicating a willingness to pay something for the service. However, interest among TV stations in increasing the number of daily reports was small. Author

N74-22270* Wisconsin Univ., Madison.
WEATHER DISSEMINATION AND PUBLIC USAGE
Margaret Schneider Stacey *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorology, Vol. 5 Nov. 1973 p 88-119 (For availability see N74-22267 13-20)
CSCL 04B

The existing public usage of weather information was examined. A survey was conducted to substantiate the general public's needs for dissemination of current (0-12 hours) weather information, needs which, in a previous study, were found to be extensive and urgent. The goal of the study was to discover how the general public obtains weather information, what information they seek and why they seek it, to what use this information is put, and to further ascertain the public's attitudes and beliefs regarding weather reporting and the diffusion of weather information. Major findings from the study include: 1. The public has a real need for weather information in the 0-6 hour bracket. 2. The visual medium is preferred but due to the lack of frequent (0-6 hours) forecasts, the audio media only, i.e., telephone recordings and radio weathercasts, were more frequently used. 3. Weather information usage is sporadic. Author

N74-22271* Wisconsin Univ., Madison.
IMPROVED WEATHER INFORMATION AND AVIATION
Kirk Hallahan and Vytautas Zdanys *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorology, Vol. 5 Nov. 1973 p 120-194 refs (For availability see N74-22267 13-20)
CSCL 04B

The major impacts of weather forecasts on aviation are reviewed. Topics discussed include: (1) present and projected structure of American aviation, (2) weather problems considered particularly important for aviation, (3) projected needs for improved

weather information by aviators, (4) safety and economics, and (5) future studies utilizing satellite meteorology. Author

N74-22272* Wisconsin Univ., Madison.
LOSSES DUE TO WEATHER PHENOMENA IN THE BITUMINOUS CONCRETE CONSTRUCTION INDUSTRY IN WISCONSIN
Herman A. J. Kuhn *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorology, Vol. 5 Nov. 1973 p 195-212 (For availability see N74-22267 13-20)
CSCL 04B

The losses (costs) due to weather phenomena as they affect the bituminous concrete industry in Wisconsin were studied. The bituminous concrete industry's response to precipitation, in the form of rain, is identified through the use of a model, albeit crude, which identifies a typical industry decision-response mechanism. Using this mechanism, historical weather data and 1969 construction activity, dollar losses resulting from rain occurrences were developed. Author

N74-22273* Wisconsin Univ., Madison.
SEVERE WEATHER STUDY
Craig J. Mills *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorology, Vol. 5 Nov. 1973 p 213-280 refs (For availability see N74-22267 13-20)
CSCL 04B

Current methods of severe weather information dissemination and the impact of this information on the general public are studied. The study is based on the responses of the general public and the local broadcasters to a severe weather incident which occurred on August 14, 1972 in the Dane County-Madison Metropolitan area. The results of the study were somewhat startling. From the sample, for instance, it was found that 45% of the Dane County population was not aware of the severe thunderstorm warning. In this case this may or may not have been critical, but had the storm been extremely severe or had a tornado and flooding been associated with the storm, a large segment of the population would have been in great danger. What this study has shown, is that the real problem with the dissemination of severe weather information is not the lack of it, but the inability to transfer it in useful form to an overwhelming majority of the general public. Author

N74-22274# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.
AIR QUALITY DATA: 1972 ANNUAL STATISTICS
Mar. 1974 144 p refs
(EPA-450/2-74-001) Avail: NTIS HC $10.25

A summary is presented of the ambient air quality data resulting from the air monitoring operations of state, local and federal network operations. The summary included data for various localities in each state on particulate matter, sulfur oxides, carbon monoxide, nitrogen dioxide, photochemical oxidants, and hydrocarbons. F.O.S.

N74-22275# Finnish Meteorological Inst., Helsinki.
LOCATING THUNDERSTORMS BY SPHERICS OBSERVATIONS [MYRSKYKESKUSTEN PAIKALLISTAMINEN SFERICS-HAVAINTOJEN AVULLA]
Risto Pirjola 1973 32 p refs In FINNISH; ENGLISH summary
(Rept-47) Avail: NTIS HC $4.75

The literature on the electromagnetic radiation of a stroke of lightning is reviewed along with the methods for locating thunderstorms. The review focuses on a method developed in Germany in the early 1960s by G. Heydt and H. Volland. Heydt and Volland studied the spectral amplitudes of the pulses, called spherics, that travel from a thunderstorm area to the observation stations. Their method is good for determining the direction of a thunderstorm with an error margin of 5 degrees, and its distance as well as discharge count with an error margin of 10%. The routine procedures involved can be accomplished by one person in 1/2 hour, and the results give a quantitative picture of thunderstorm conditions within the radius of 3000 km in summer, and 4500 km in winter. Author

N74-22276# Finnish Meteorological Inst., Helsinki.
DIURNAL VARIATIONS IN TEMPERATURE AND WHAT AFFECTS THEM [LAEMPOETILAN VUOROKAUSIVAIHTELUSTA JA SIIHEN VAIKUTTAVISTA TEKIJOEISTAE]
Raino Heino 1973 61 p refs In FINNISH; ENGLISH summary
(Rept-46) Avail: NTIS HC $6.25

The diurnal temperature variations in different parts of Finland throughout the year are discussed along with the influence that clouds, wind, and surface properties have on the daily temperature changes. The following generalizations are presented. The diurnal temperature variation is greatest in spring. Throughout the year, the lowest temperatures occur at sunrise, earlier in winter than in summer. In winter, the highest temperatures occur about 2 hours, and in summer about 3 hours, after noon. Temperatures rise fastest 4 hours after sunrise, and sink fastest shortly after sundown. In summer, regular daily variation accounts for 80% of the absolute variation; in winter, this figure approaches 0%. Due to advective factors, the greatest daily change can be as large as 30 C, that due to radiation, 20-30 C. In large urban centers, day temperatures are generally 0.5 C and night temperatures 1.0-5 C higher than in the surrounding countryside. Author

N74-22277# Schweizerische Meteorologische Zentralanstalt, Zurich.
ANNALS OF THE CENTRAL METEOROLOGICAL INSTITUTE OF SWITZERLAND, 108TH ISSUE, 1971 [ANNALEN DER SCHWEIZERISCHEN METEOROLOGISCHEN ZENTRALANSTALT, HUNDERTACHTER JAHRGANG 1971]
May 1973 260 p In GERMAN
Avail: NTIS HC $16.00

The meteorological observations conducted at various weather stations in Switzerland during 1971 are tabulated. Detailed reports for each month are presented in a prescribed format to show variations of meteorological parameters from standard conditions. A special section on thunderstorms and hail storms is provided. The number of days in which the precipitation exceeded one millimeter are tabulated for each month. Radiosonde measurements of wind strength, wind direction, temperature, and cloud cover at various levels are reported. Transl. by P.N.F.

N74-22278# Schweizerische Meteorologische Zentralanstalt, Zurich.
RESULTS OF DAILY PRECIPITATION MEASUREMENTS AT THE METEOROLOGICAL AND RAIN MEASUREMENT STATIONS OF SWITZERLAND, 1971 [ERGEBNISSE DER TAEGLICHEN NIEDERSCHLAGSMESSUNGEN AUF DEN METEOROLOGISCHEN UND REGENMESS-STATIONEN DER SCHWEIZ, 1971]
Jul. 1972 178 p In GERMAN
Avail: NTIS HC $12.00

Tables contain daily rainfall data as well as monthly and yearly percentages for all precipitation measuring stations of Switzerland. Transl. by G.G.

N74-22279# Schweizerische Meteorologische Zentralanstalt, Zurich.
CLIMATOLOGY OF SWITZERLAND. BOOK 1, PART 3: WIND [KLIMATOLOGIE DER SCHWEIZ: WIND, 1-3 TEIL]
M. Schueepp 1973 62 p In GERMAN
Avail: NTIS HC $6.25

Tables of data are presented to show the wind conditions at various airports and meteorological stations in Switzerland. The location, development, and capabilities of the various weather stations are described. Some of the observations cover the period from 1901 to 1960. A map of the location of the meteorological stations is provided. Diagrams of the wind roses for each meteorological station are developed. Transl. by P.N.F.

N74-22280 Swiss Inst. of Meteorology, Zurich.
SWISS METEOROLOGICAL BIBLIOGRAPHY [BIBLIOGRAPHIE METEOROLOGIQUE SUISSE]
Jul. 1973 25 p refs In FRENCH
Avail: NTIS HC $4.25

A Swiss bibliography covering synoptic meteorology, meteorological services, instruments, and stations is presented. Data

are also given on climatology, microclimatology, and the effects of cosmic, terrestrial, and artifical processes on meteorological phenomena. Transl. by E.H.W.

N74-22281*# Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
CHEMILUMINESCENT MEASUREMENT OF ATMOSPHERIC ACID Final Report
D. H. Stedman and G. L. Kok 6 May 1974 41 p refs
(Grant NGR-23-005-599)
(NASA-CR-138165; Rept-012119-1-F) Avail: NTIS HC $5.25 CSCL 04A

The design and construction of a gas phase acid sensitive analyzer are reported. These studies showed that the chemical system was a practical analytical method. A complete instrument was developed and prepared for field testing. A Titan 3-C rocket was scheduled for launching on February 11, 1974. Through preparations made by NASA Langley the instrument was set up to monitor the acid concentration in the rocket exhaust. Due to adverse wind conditions no acid was detected. This entire trip is described in detail. Author

N74-22282*# Scientific Translation Service, Santa Barbara, Calif.
STUDY OF CLOUDINESS PARAMETERS BASED ON MEASUREMENTS FROM THE KOSMOS-384 SATELLITE
A. B. Akvilonova, A. Ye. Basharinov, A. K. Gorodetskiy, A. S. Gurvich, M. S. Krylova, B. G. Kutuza, D. T. Matveyev, and A. P. Orlov Washington NASA Jul. 1973 9 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Atmos. Okeana (USSR), vol. 9, no. 2, 1973 p 187-189
(Contract NASw-2483)
(NASA-TT-F-14735) Avail: NTIS HC $4.00 CSCL 04B

Atmospheric cloudiness parameters were determined based on Kosmos-384 radio observations over the Pacific Ocean at 0.8 cm and 10 microns. Author

N74-22283*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ESTIMATE OF CONTRIBUTION OF JET AIRCRAFT OPERATIONS TO TRACE ELEMENT CONCENTRATION AT OR NEAR AIRPORTS
J. Stuart Fordyce and Dean W. Sheibley Washington May 1974 12 p refs
(NASA-TM-X-3054; E-7840) Avail: NTIS HC $3.00 CSCL 13B

Samples of ASTM type A jet fuel were analyzed for trace-element content by instrumental neutron activation techniques. Forty-nine elements were sought. Only ten, aluminum, gold, indium, lanthanum, titanium, vandium, barium, dysprosium, tellurium, and uranium, were observed at levels above the detection limits encountered; of these only aluminum, titanium, and barium were present at concentrations greater than 0.1 ppm. Estimates of exhaust gas concentrations are made, and the ambient contribution at or near airports is calculated by using the Los Angeles International Airport dispersion model. It is shown that the ambient contribution is about an order of magnitude below typical urban levels for virtually all elements sought. Author

N74-22284# Environmental Protection Agency, Research Triangle Park, N.C.
STATE AIR POLLUTION IMPLEMENTATION PLAN Progress Report, 30 Jun. - 31 Dec. 1973
Apr. 1974 119 p refs
(EPA-450/2-74-004) Avail: NTIS HC $9.00

Plans for attainment of national ambient air quality standards were submitted by all states. Progress is described toward implementing those plans from June 30 to December 31, 1973. Presently, 16 State Implementation Plans (SIPs) have been fully approved by EPA, discounting disapprovals with respect to maintenance of national standards. The status of Federal assistance to states in implementation of SIPs and state and local resource requirements for SIP implementation are examined. National issues affecting the SIPs are discussed. The adequacy of air monitoring networks and air quality data reporting is reviewed. Efforts are needed to improve the distribution and quantity of monitors and to assure timely data reporting. EPA's Plan Revision Management System is discussed. The system, which identifies possible deficiencies in the attainment of air quality standards, was extended to cover 67 Air Quality Control Regions. Deficiencies identified are being investigated by the Regional Offices. The status of EPA enforcement activities is also presented. Compliance schedules are being developed for all major sources, and these schedules are being monitored and enforced. Author

N74-22285# Environmental Protection Agency, Research Triangle Park, N.C.
AIR POLLUTION ENGINEERING MANUAL
John A. Danielson, ed. May 1973 1016 p refs Prepared in cooperation with Los Angeles County Air Pollution Control District
(AP-40) Avail: NTIS MF $1.45; SOD HC $13.10; EPA Research Triangle Park, N. C. 27711

A manual on air pollution control is presented with emphasis on the practical engineering problems of design and operations at specific industrial and commercial sources of air pollution. Topics discussed include: design of exhaust systems; air pollution control equipment for particulate matter, gases and vapors; and metallurgical, mechanical, petroleum, incineration, combustion, and chemical processing equipment. F.O.S.

N74-22286*# Northrop Services, Inc., Huntsville, Ala.
STOCHASTIC MODEL OF TEMPORAL CHANGES OF WIND SPECTRA IN THE FREE ATMOSPHERE
Yi Hui Huang May 1974 50 p refs
(Contract NAS8-21810)
(NASA-CR-129027; M-1259) Avail: NTIS HC $3.25 CSCL 04B

Data for wind profile spectra changes with respect to time from Cape Kennedy, Florida for the time period from 28 November 1964 to 11 May 1967 have been analyzed. A universal statistical distribution of the spectral change which encompasses all vertical wave numbers, wind speed categories, and elapsed time has been developed for the standard deviation of the time changes of detailed wind profile spectra as a function of wave number. Author

N74-22287# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Feb. 1973 [POLLUTION ATMOSPHERIQUE I. FUMEE ET ANHYDRIDE SULFUREUX II. MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT BULLETIN MENSUEL, FEVRIER 1973]
Feb. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $5.00

Data obtained at Belgian weather stations for February 1973 are tabulated. The air pollution apparatus and rain gage are briefly decribed. ESRO

N74-22288# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Jan. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, JANVIER 1974]
Jan. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $4.00

Metorological parameters observed at different Belgian weather stations during January 1974 are given. ESRO

N74-22289# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Feb. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, FEVRIER 1973]
Feb. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $4.75

Synoptic measurements made at different Belgian weather stations in February 1973 are given. ESRO

N74-22290# Institut Royal Meteorologique de Belgique, Brussels.

SYNOPTIC OBSERVATIONS Monthly Bulletin, Mar. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, MARS 1973]
Mar. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $4.75

Synoptic measurements made at different Belgian weather stations in March 1973 are given. ESRO

N74-22291# Naval Postgraduate School, Monterey, Calif.
COMPARISON OF FLEET NUMERICAL WEATHER CENTRAL ACOUSTIC PREDICTION SYSTEM WITH THE INTEGRATED CARRIER ACOUSTIC PREDICTION SYSTEMS M.S. Thesis
Timothy James Fitzgerald Mar. 1974 80 p refs
(AD-775021) Avail: NTIS CSCL 04/2

The Naval Oceanographic Office developed the Integrated Carrier Acoustic Prediction System (ICAPS) in order to perform on-scene acoustic forecasts for the Fleet. To evaluate the system, bathythermographic information was obtained for points in the North Atlantic during the naval exercise SEACONEX. Fleet Numerical Weather Central (FNWC) provided climatological and synoptic temperature profiles along with related acoustical forecasts for the points under study. Similarly, ICAPS supplied a combined climatological and synoptic temperature profile and related acoustic forecasts for each of the points. Comparisons of the two systems were made against an actual mean temperature profile and the acoustic forecast that it generated. (Modified author abstract) GRA

N74-22292# Massachusetts Inst. of Tech., Cambridge. Operations Research Center.
OPTIMAL CONTROL OF SULFUR DIOXIDE EMISSIONS AT POWER STATIONS: MODELS AND A CASE STUDY
Nitin R. Patel Sep. 1973 128 p refs
(Contract DAHC04-73-C-0032)
(AD-775392; AROD-9239-10-M; TR-82) Avail: NTIS CSCL 04/2

The principal concern of this thesis is to analyze emission control strategies which depend upon meteorological conditions. A meteorological model is developed to relate source emissions with average concentration of a pollutant in a region under different meteorological conditions. The problem of determining optimal dynamic controls for SO2 emissions at fossil-fueled power stations is treated by constructing a linear programming model. This model is extended to encompass seasonal control of sources which are not amenable to more frequent controls. Another extension is constructed to analyze the effects of errors in meteorological forecasts. The various models are applied to the Metropolitan Boston Air Pollution Control District. The impact of dynamic emission controls on new site selection for fossil-fueled power stations is examined. A stochastic linear programming formulation is developed and an algorithm is designed to solve the stochastic linear programming problem. (Modified author abstract) GRA

N74-22293# Weather Squadron (12th), Ent AFB, Colo.
COMPARING CORRELATIONS BETWEEN WEATHER MAPS WITH SIMILAR ISOBARIC CONFIGURATIONS BUT VARYING PRESSURE INTENSITIES
Peter R. Scholefield Jul. 1973 20 p ref
(AD-775361; Tech-Paper-73-8) Avail: NTIS CSCL 04/2

In all 4th Weather Wing and 12th Weather Squadron map typing studies one mathematical formula has been used exclusively as the basis for determining the similarity between weather map patterns. This paper illustrates how this linear correlation coefficient formula behaves when it is used to correlate surface weather map patterns that are similarily configured but differ in respect to their direction of flow patterns, their pressure gradients and their pressure magnitude. Ten pictorial surface weather maps are used as examples in the computer correlation procedure and the results clarify the relationship between similar map types, their pressure gradients and their degree of correlation with each other. Author (GRA)

N74-22294# Naval Postgraduate School, Monterey, Calif.
LABORATORY INVESTIGATION OF ELECTRICAL DISSIPATION OF WARM FOG M.S. Thesis
Leslie Bruce Herman Dec. 1973 93 p refs
(AD-775029) Avail: NTIS CSCL 04/2

A 27-cubic-foot fog chamber was constructed to investigate fog clearing by electrical means. Fogging of the chamber was accomplished with a spray nozzle driven by pre-humidified air, producing water droplets ranging from 10 micrometers to 75 micrometers. A corona discharge head in the center of the chamber was operated from 0 to 100 kV and measurements of fog conditions were made optically and with coated slides placed at various positions in the chamber. Rapid clearing was caused by the corona discharge. (Modified author abstract) GRA

N74-22295# Naval Weather Service, Washington, D.C.
SOUTHWEST PACIFIC AND AUSTRALIAN AREA TROPICAL CYCLONE STRIKE PROBABILITIES. VOLUME 1: 24-HOUR MOVEMENT. VOLUME 2: 48-HOUR MOVEMENT. VOLUME 3: 72-HOUR MOVEMENT
Harold L. Crutcher and Lee R. Hoxit Feb. 1974 215 p refs
(AD-775350) Avail: NTIS CSCL 04/2

Probabilities relating to the future movement of Southwest Pacific and Australian area tropical cyclones are presented. The probabilities are based on observational data of successive 12-hour positions of the centers of these storms. The data are stratified into five seasons: December - January, February, March, April and May-November. Geographical areas are defined by five-degree latitude-longitude squares. The probabilities are computed assuming the initial storm position or origin is always at the center of the square and the target areas are always circular areas with radii of one, two and three degrees latitude which are also located at the center of the squares. These probabilities indicate the chance of the storm center being within the target areas at the end of specified time intervals. Two sets of probabilities are presented for each square: one set for the case when the origin is at the center of the master square, and a second set for the case where the target areas are centered on this square. Values for time intervals of 72 hours are presented. (Modified author abstract) GRA

N74-22296# Advanced Technology Labs., Inc., Westbury, N.Y.
DROPLET SPECTRA IN LAYER-CLOUDS
S. Elzweig and P. Baronti Feb. 1974 28 p refs
(Contract F44620-70-C-0007; AF Proj. 9781)
(AD-775044; ATL-TR-194; AFOSR-74-0244TR) Avail: NTIS CSCL 04/2

A model is constructed for the determination of droplet spectra in layer clouds with regions of supersaturation and unsaturation, as may be the case for steady layers under a subsidence inversion. Droplet spectra distributions within the cloud have been obtained by the solution of the steady-state spray equation, which has been solved by a finite difference technique. The dependence of droplet spectra on conditions of supersaturation, population of activated nuclei and cloud thickness has been established. Distribution of supersaturation across layer clouds are not available; realistic droplet distribution are obtained, however, for estimates of supersaturation that appear reasonable. The suggestion is put forth that in widespread continental layer clouds droplet evaporation may occur at the base of the cloud and droplet condensation at the top. Also in this case, reasonable values of droplet distribution may be obtained by the use of the spray equation. Author (GRA)

N74-22297# Atmospheric Sciences Office, White Sands Missile Range, N.Mex.
THE 11602 LANCE MISSILE NO. 2527, ROUND NO. 204 RCT (13 DECEMBER 1973)
Dec. 1973 52 p
(DA Proj. 1T6-65702-D-127)
(AD-774870; DR-810) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11602 Lance, Missile Number 2527, Round Number 204 RCT, are presented in tabular form. Author (GRA)

N74-22298# Pacific Missile Range, Point Mugu, Calif.
CLIMATIC HANDBOOK FOR POINT MUGU AND SAN NICOLAS ISLAND. PART 2: UPPER-AIR DATA
Robert DeViolini 19 Jan. 1974 291 p refs
(AD-775444; PMR-TP-74-2-Pt-2) Avail: NTIS CSCL 04/2

In the handbook, upper-air climatic data for Point Mugu and San Nicolas Island relating to wind, temperature, pressure, and density between sea level and 200,000 feet (62 kilometers)

are presented by both month and season. This publication is a companion volume to PMR-TP-74-1, Climatic Data for Point Mugu and San Nicolas Island, Part I, Surface Date.
Author (GRA)

N74-22299# Atmospheric Sciences Office, White Sands Missile Range, N.Mex.
THE 16201 LITTLE JOHN MISSILE NO. 3159, ROUND NO. 706 RM (5 FEBRUARY 1974) Meteorological Data Report
Feb. 1974 17 p
(DA Proj. 1T6-65702-D-127)
(AD-774875; DR-815) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 16201 Little John, Missile Number 3159, Round Number 706 RM, are presented in tabular form. Author (GRA)

N74-22300# Atmospheric Sciences Office, White Sands Missile Range, N.Mex.
THE 14801 LANCE, MISSILE NO. 2203, ROUND NO. 209 APT (7 FEBRUARY 1974) Meteorological Data Report
Feb. 1974 36 p
(DA Proj. 1T6-65702-D-127)
(AD-774876; DR-816) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 14801 Lance, Missile Number 2203. Round Number 209 APT, are presented in tabular form. Author (GRA)

N74-22301# Atmospheric Sciences Office, White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN MISSILE NO. 1785, ROUND NO. 639 AML (11 DECEMBER 1973) Meteorological Data Report
Dec. 1973 17 p
(DA Proj. 1T6-65702-D-127)
(AD-774869; DR-809) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 03702 Honest John, Missile Number 1785, Round Number 639 AML, are presented in tabular form. Author (GRA)

N74-22302# Atmospheric Sciences Office, White Sands Missile Range, N.Mex.
THE 16101 LITTLE JOHN MISSILE NO. 3136, ROUND NO. 704 RM (28 NOVEMBER 1973)
Nov. 1973 16 p
(DA Proj. 1T6-65702-D-127)
(AD-774868; DR-807) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 16101 Little John, Missile Number 3136, Round Number 704 RM, are presented in tabular form. Author (GRA)

N74-22303# Atmospheric Sciences Office, White Sands Missile Range, N.Mex.
THE 14804 LANCE MISSILE NOS. 2201/2208 ROUND NOS. 205 APT/206 APT/24 Meteorological Data Report
Jan. 1974 48 p refs
(DA Proj. 1T6-65702-D-127)
(AD-774872; DR-812) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 14804 Lance, Missile Numbers 2201/2208, Round Numbers 205 APT/206 APT, are presented in tabular form. Author (GRA)

N74-22304# Army Engineer Topographic Labs., Fort Belvoir, Va.
RAINFALL INTENSITIES IN THE CONTERMINOUS UNITED STATES AND HAWAII Final Report
Thomas E. Niedringhaus Nov. 1973 36 p refs
(DA Proj. 1F1-62203-A-119)
(AD-775459; ETL-SR-74-3) Avail: NTIS CSCL 04/2
The report and sections of Report No. 4 of the series Studies of Army Aviation (V/STOL) Environment entitled Distribution of Mean Monthly Precipitation and Rainfall Intensities (ETL-SR-72-5) present maps of the distribution of rainfall intensities for durations of 5, 30, and 60 minutes and return periods of 10, 25, and 100 years within the conterminous United States and Hawaii. The 5-minute values displayed on the maps were derived from existing 30-minute maps by multiplying the 30-minute values by a constant (0.37) and interpolating between isohyets. To provide a check on the foregoing method, data for excessive precipitation from 54 U.S. weather stations were subjected to extreme value analysis, and 5-minute amounts were obtained for the various return periods. GRA

N74-22305# North Central Forest Experiment Station, St. Paul, Minn.
MEAN PRECIPITATION-HOURS FOR THE CONTERMINOUS UNITED STATES Final Report
Donald A. Haines Nov. 1973 22 p refs
(PB-226477/8GA; FSRP-NC-98) Avail: NTIS HC $2.75 CSCL 04B
The report examines aspects of precipitation-hours per unit time. The study presents nationwide patterns of mean precipitation-hours per month as well as precipitation-hours per precipitation-day. GRA

N74-22306# Weather Squadron (12th), Ent AFB, Colo.
MAP TYPE CATALOG FOR THE MAINE WINDOW
Robert C. Sabin, Richard L. Nieman, and Hal W. Wold Dec. 1973 175 p
(AD-775369; Tech-Paper-73-12) Avail: NTIS CSCL 04/2
A standardized procedure has been developed to determine the synoptic map types which have occurred over a specified area (window). The map type catalog is a summarization of information relating to these map types for the Maine window. (There is a catalog for each of the 14 windows which cover the United States). The catalog includes characteristics of the map types and listings of each map in the data base (25 years of surface pressure maps) along with its most similar map type.
Author (GRA)

N74-22307# Weather Squadron (12th), Ent AFB, Colo.
MAP TYPE CATALOG FOR THE OKLAHOMA WINDOW
Robert C. Sabin, Richard L. Nieman, and Hal W. Would Oct. 1973 176 p
(AD-775370; Tech-Paper-73-11) Avail: NTIS CSCL 04/2
A standardized procedure has been developed to determine the synoptic map types which have occurred over a specified area (window). The map type catalog is a summarization of information relating to these map types for the Oklahoma window. (There is a catalog for each of the 14 windows which cover the United States.) The catalog includes characteristics of the map types and listings of each map in the data base (25 years of surface pressure maps) along with its most similar map type.
Author (GRA)

N74-22308# Air Force Global Weather Central, Offutt AFB, Nebraska.
TROPICAL ANALYSIS MODEL Final Report
James F. Brown 1 Nov. 1973 23 p refs
(AD-775362; AFGWC-TM-73-3) Avail: NTIS CSCL 04/2
The AFGWC objective tropical computer analysis programs produce gridded surface pressure and temperature analyses, gridded computed temperature and D-values fields for 1000MB, temperature-dewpoint spread analyses 850-400MB, and temperature, wind and D-value analyses 850-100MB. First guess fields are derived from forecast/persistence. Validated observations are used to correct the first guess fields in the analysis. A special technique is used to insure vertical consistency.
Author (GRA)

N74-22309# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs.
THE NATIONAL AIR MONITORING PROGRAM: AIR QUALITY AND EMISSIONS TRENDS, VOLUME 1 Annual Report
Aug. 1973 182 p
(PB-226490/1GA; EPA-450/1-73-001A-Vol-1) Avail: NTIS HC $5.25 CSCL 13B
This report represents the first major attempt in the history of the Federal air program to evaluate trends in air quality and emissions on both a national and a regional basis. Based on data from the National Air Sampling Networks, air quality trends are presented for: Total suspended particulates for 1960 through 1971; carbon monoxide, oxides of nitrogen, and oxidants for 1962 through 1971; and sulfur dioxide for 1964 through 1971. Included is a detailed evaluation of ambient air quality for three

Air Quality Control Regions. For the period 1940 through 1970, emissions trends are presented on a national basis only. Air quality data, emissions data, and summaries of monitoring activities are presneted for each State and Air Quality Control Region. Specific program areas emphasized are data acquisition and analysis, and trend identification and interpretation.
Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-22310# Naval Weapons Lab., Dahlgren, Va.
ANALYSIS OF NAVIGATION ERROR SOURCES FOR THE TIMATION DNSS (DEFENSE NAVIGATION SATELLITE SYSTEMS) OPTION
Everett R. Swift Nov. 1973 38 p refs
(AD-774912; NWL-TR-3067) Avail: NTIS CSCL 17/7

The proposed Defense Navigation Satellite System (DNSS) (called TIMATION by the Naval Research Laboratory) was evaluated in terms of aspects relating directly to the navigation performance of the System. Three areas were examined: configuration stability; orbit determination and prediction accuracy; and navigation. The first two areas were evaluated in terms of their effects on navigation accuracy. The error sources considered included gravity field modeling, Earth tides modeling, radiation pressure modeling, and observation biases and precision. The major error sources for navigation using the TIMATION system are radiation pressure modeling and the degree of synchronization of the satellites: clocks. (Modified author abstract) GRA

N74-22311# Army Electronics Command, Fort Monmouth, N.J.
INJECTION LASER TERRAIN FOLLOWING SYSTEM (ILTFS)
E. Schiel, P. Gammarino, A. Kleider, and E. Aras Feb. 1974 26 p refs
(DA Proj. 1S7-62705-A-056)
(AD-774790; ECOM-4197) Avail: NTIS CSCL 17/7

A model has been developed of a subsystem designed to sense the trend of the terrain ahead of low flying rotary wing aircraft. This sensor subsystem, a forerunner of a terrain following system, incorporates a high peak power injection laser transmitter and an optical receiver with a high sensitivity silicon avalanche detector. In operation, the slant range from the aircraft to the terrain is continuously measured to sense terrain variations. Experimental data have confirmed the results of a performance analysis which indicates that the system is capable of determining the terrain trend at a horizontal range of 300 m along the aircraft flight vector under background limited conditions.
Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-22312*# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES OF HEAT RESISTANT MATERIALS FOR HIGH-TEMPERATURE GAS REACTOR
Shozo Sekino Washington NASA May 1974 30 p Transl. into ENGLISH of "Koon Gasu Ro Yo Tainetsu Zairyo No Kento", Nippon Steel Corp., Tech. Res. Inst., Yawata, Japan, report, 18 Oct. 1973 21 p
(Contract NASw-2481)
(NASA-TT-F-15576) Avail: NTIS HC $4.50 CSCL 18J

As one of the countermeasures against the energy crisis, hope is entertained for the development of nuclear energy. MHD power generation may be of assistance from the standpoint of improved energy efficiency; high-temperature gas reactors are noted for their high efficiency. The GGA Company has developed a large-scale commercial high-temperature gas reactor whose prospects for the future are good. A preliminary requirement for using high-temperature gas economically and safely is the development of heat-resistant materials. Data are summarized concerning the suitability for this purpose of the existing alloys, including the alloys which are currently being mentioned as candidates. Data on corrosion resistance, creep resistance, thermal fatigue resistance, structural stability, weldability and machinability are reported.
Author

N74-22313# Los Alamos Scientific Lab., N.Mex.
PERFORMANCE OF (U,Zr)C-GRAPHITE (COMPOSITE) AND OF (U,Zr)C-(CARBIDE) FUEL ELEMENTS IN THE NUCLEAR FURNACE 1 TEST REACTOR
L. L. Lyon Sep. 1973 63 p refs
(Contract W-7405-eng-36)
(LA-5398-MS) Avail: NTIS HC $5.45

The properties of and reactor test results for two types of nuclear-propulsion-reactor fuel elements containing uranium-zirconium carbide, (U,Zr)C, are reported. Composite fuel elements containing graphite and approximately 35 vol % carbide, along with fuel elements consisting only of carbide, were tested in Los Alamos Scientific Laboratory's Nuclear Furnace 1 reactor for 109 min at peak power densities of approximately 4500 MW/cu m and temperature up to 2500 K. Fission-fragment damage to the graphite phase of the composite fuel elements increased the room temperature thermal resistivity of the matrix ninefold, resulting in unexpected high mass losses of carbon. The carbide elements developed both longitudinal and transverse fractures but did not fragment into small-size particles.
Author (NSA)

N74-22314# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Reaktorbauelemente.
SUPERHEATED STEAM-CORROSION LOOP FOR THE INVESTIGATION OF THE CORROSION MECHANISM UNDER CONDITIONS OF HEAT TRANSFER IN AN ISOTHERMAL STATE
K. Marten and J. Vasarhelyi Aug. 1973 79 p refs In GERMAN; ENGLISH summary
(KFK-1842) Avail: AEC Depository Libraries HC $6.00

The selection of appropriate materials for steam superheaters operated by gases or liquid metals and for fuel element claddings used in steam-cooled reactors must be preceded by an investigation of the corrosion mechanism acting upon austenitic materials caused by a superheated steam flow past them with special attention being paid to heat transfer. The investigations called for the construction of a suitable circuit. The facility was designed, constructed and commissioned taking into account specific criteria, such as high-purity steam and very variable system pressures. The circuit represents a closed thermal system. It consists of six test sections accommodating rods with indirect electrical heating for the investigation of the corrosion mechanism under conditions of heat transfer and two test sections used for corrosion investigations of materials in an isothermal state. Since the goal in the design of modern power units is to achieve high system pressures and temperatures, the plant was rated for a maximum pressure of 300 atm.
Author (NSA)

N74-22315# Naval Research Lab., Washington, D.C.
COOPERATIVE RADIATION EFFECTS SIMULATION PROGRAM Semiannual Progress Report, 1 May - 31 Oct. 1973
L. E. Steele and E. A. Wolicki Feb. 1974 111 p refs
(NRL Proj. PO-4-0030)
(AD-775297; NRL-MR-2755) Avail: NTIS CSCL 18/10

The report describes progress in: (1) developing the NRL Code E-DEP-1 for energy deposition by heavy ions, (2) modifying the Manning and Pagett transport theory for the penetration of heavy ions near the surface, (3) an investigation of the total cross section corresponding to the differential cross section of Lindhard, Nielsen, and Scharaff, (4) an investigation of the temperature dependence of nickel-ion damage in nickel, (5) a study of the flux (dose rate) effects for 2.8 MeV 58Ni(+) irradiations of pure nickel, (6) studies of helium mobility in metals,

(7) the cyclotron helium implantation facility, and (8) the effect of cyclotron implanted helium on the fatigue behavior and microstructure of 316 stainless steel at 650C. GRA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-22316 Brown Univ., Providence, R.I.
MODAL ANALYSIS OF PROBLEMS IN OPTICAL FIBERS Ph.D. Thesis
Angel Cardama Aznar 1973 80 p
Avail: Univ. Microfilms Order No. 74-2989

Propagation in metallicly coated optical fibers is studied; as the radius of the coating becomes very large compared to the wavelength and the radius of the core, the problem can be considered as a limiting case of the open fiber. This enables one to calculate by a normal node solution the reflected energy at the fiber end when studying the launching of surface modes, or the scattering of those modes at discontinuities. Launching efficiencies of the HE sub 11 mode from truncated uniform plane waves and Gaussian beams and the effects of tilts, offsets, and gaps in fiber joints are considered and compared to the corresponding Born Approximations. Dissert. Abstr.

N74-22317# National Bureau of Standards, Washington, D.C. Heat Div.
OPTICAL RADIATION MEASUREMENTS: APPROXIMATE THEORY OF THE PHOTOMETRIC INTEGRATING SPHERE Final Report
W. B. Fussell Mar. 1974 39 p refs
(NBS-TN-594-7) Avail: SOD HC $0.75 as C13.46:594-7

An approximate mathematical theory of the photometric integrating sphere is developed. The analysis is accurate to the first order in the ratio of the baffle area to the sphere wall area. The sphere is assumed to be occupied by a circular baffle and a spherical lamp; the centers of the baffle and the lamp lie on a diameter of the sphere. Surfaces of the sphere and the baffle are assumed to reflect in a uniformly diffuse manner. The lamp is assumed to absorb a fraction of the radiation incident upon it, and to transmit (or specularly reflect) the remainder. Luminance distribution at the sphere window is derived for a general source input at any point of the sphere wall. A model lamp illuminance distribution is assumed, and a formula for the fractional error in comparing the total luminous fluxes of two lamps in the integrating sphere, is derived. The physical significance of the formula is described. Author

N74-22318*# Ohio State Univ., Columbus. ElectroScience Lab.
REACTION FORMULATION FOR RADIATION AND SCATTERING FROM PLATES, CORNER REFLECTORS AND DIELECTRIC-COATED CYLINDERS
Nan N. Wang Apr. 1974 135 p refs
(Grant NGL-36-008-138)
(NASA-CR-138175; ESL-2909-15) Avail: NTIS HC $9.75 CSCL 20N

The reaction concept is employed to formulate an integral equation for radiation and scattering from plates, corner reflectors, and dielectric-coated conducting cylinders. The surface-current density on the conducting surface is expanded with subsectional bases. The dielectric layer is modeled with polarization currents radiating in free space. Maxwell's equation and the boundary conditions are employed to express the polarization-current distribution in terms of the surface-current density on the conducting surface. By enforcing reaction tests with an array of electric test sources, the moment method is employed to reduce the integral equation to a matrix equation. Inversion of the matrix equation yields the current distribution, and the scattered field is then obtained by integrating the current distribution. The theory, computer program and numerical results are presented for radiation and scattering from plates, corner reflectors, and dielectric-coated conducting cylinders. Author

N74-22319*# Techtran Corp., Silver Spring, Md.
A STUDY OF CORONAL CONDENSATIONS BY MEANS OF THEIR X-UV LINE SPECTRUM
G. Chambe Washington NASA Aug. 1973 19 p refs Transl. into ENGLISH from Atstron. Astrophys. (West Germany - U. S.), v. 12, 1971 9 p
(Contract NASw-2485)
(NASA-TT-F-14745) Avail: NTIS HC $4.00 CSCL 17E

An interpretation of the X-UV resonance line spectrum of coronal condensations is given in terms of thermal emission from non-homogeneous regions, i.e., with a continuous range of temperatures. It is shown that the temperature and the emission measure derived from the measured intensities of two lines depend on the pair of lines in such a way that an isothermal model cannot account for wide ionization and excitation potential ranges. In addition, the formation temperature domain of each line is not fine enough to neglect the variations of emission measures inside it. This calculation is adapted to the observed intensities of the Fe. XV, XVI, lines at approximately 300A, the Si VIII to XII lines in the 40-70A band, and the O VII, VIII, Ne IX, X and Fe XVII, XVIII lines between 10 and 25A. Author

N74-22320# Aeronautical Research Labs., Melbourne (Australia).
A METHOD FOR THE ACCURATE DETERMINATION OF THERMAL DIFFUSE SCATTERING OF X-RAYS
G. R. Towers Oct. 1973 5 p
(ARL/Met-Note-91) Avail: NTIS HC $4.00

It is shown that X-ray intensity measurements made at three temperatures are sufficient to allow separation of the thermal diffuse scattering from the total scattered intensity in certain temperature ranges where the phonon energy is no longer given by kT. Author

N74-22321*# National Aeronautics and Space Administration, Washington, D.C.
MAGNETO-OPTICS: OPTICAL DETECTION OF PARAMAGNETIC ELECTRONIC RESONANCE BY MEASURING THE PARAMAGNETIC ROTARY POLARIZATION OF A VISIBLE RADIATION
Alfred Kastler Jul. 1973 4 p refs Transl. into ENGLISH from Compt. Rend. (Paris), v. 232, no. 10, 1951 p 62-64
(NASA-TT-F-14725) Avail: NTIS HC $4.00 CSCL 20F

It is demonstrated that the electronic magnetic resonance of paramagnetic ions produced by a high frequency magnetic field in the presence of a constant field must influence the magnetic rotary polarization of these ions observed with a visible radiation. Author

N74-22322*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
ASRDI OXYGEN TECHNOLOGY SURVEY. VOLUME 5: DENSITY AND LIQUID LEVEL MEASUREMENT INSTRUMENTATION FOR THE CRYOGENIC FLUIDS OXYGEN, HYDROGEN, AND NITROGEN
Hans M. Roder Washington NASA 1974 72 p refs Sponsored by NASA
(NASA-SP-3083-Vol-5) Avail: NTIS HC $3.75 CSCL 20L

Information is presented on instrumentation for density measurement, liquid level measurement, quantity gauging, and phase measurement. Coverage of existing information directly concerned with oxygen was given primary emphasis. A description of the physical principle of measurement for each instrumentation type is included. The basic materials of construction are listed if available from the source document for each instrument discussed. Cleaning requirements, procedures, and verification techniques are included. Author

N74-22323*# Hydrospace-Challenger, Inc., San Diego, Calif.
NOISE MEASUREMENTS AT STOCKTON AIRPORT OBTAINED DURING ENGINEERING EVALUATION OF TWO-SEGMENT APPROACHES IN A DC-8-61 AIRCRAFT
Ray E. Glass 4 Feb. 1974 23 p
(Contract NAS2-7369)
(NASA-CR-114740) Avail: NTIS HC $4.25 CSCL 20A

A series of noise measurements were made during engineering evaluation tests of the two segment approach using a DC-8-61. The two approaches evaluated were: (1) ILS, 2.9 deg glide slope using 50 deg flaps; and (2) two segment 5.5 deg/2.9 deg glide slope, using 50 deg flaps and lower segment intercept altitude of 575 feet. Measurements were made at twelve sites underneath and to the side of the flight path. Author

N74-22324# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
WAVELENGTHS AND STRENGTHS OF HYDROGEN AND HELIUM
S. B. Kemic 15 Apr. 1974 29 p refs Sponsored in part by NBS
(JILA-113) Avail: NTIS HC $4.50

A complete tabulation of numerical calculation results on positions and strengths of the more important optical lines of hydrogen and helium in a large magnetic field is presented. These data are applicable to predict spectral features of these elements as produced in the atmospheres of magnetic white dwarfs. G.G.

N74-22325# Naval Postgraduate School, Monterey, Calif.
WIDE BAND ANALOG SIGNAL PROPAGATION IN A FIBER OPTIC SYSTEM M. S. Thesis
Robert Dean Stolt Mar. 1974 41 p refs
(AD-775017) Avail: NTIS CSCL 20/6

State of the art advances in fiber optics have reached the point at which modulated light signals can be transmitted by means of a fiber optic bundle and subsequently detected. A system capable of modulating a light emitting diode with wide band analog signals, transmission through a fiber optic bundle, and subsequent detection is investigated. Tests are conducted to determine frequency response, linear dynamic range, saturation levels, minimum discernible signal, noise figure, and spectrum characteristics of the system. As a result of the investigation, it is determined that the system is suitable for transmission of information to tape recorders from receiver systems and is capable of other analog information applications where signal frequencies do not exceed seven megahertz. Author (GRA)

N74-22326# Office of Naval Research, London (England).
NATO ADVANCED STUDY INSTITUTE: LARGE SCALE APPLICATION OF SUPERCONDUCTIVITY AND MAGNETISM
Robert A. Hein 26 Nov. 1973 14 p
(AD-774881; ONRL-C-26-73) Avail: NTIS CSCL 09/3

The NATO Institute was held from 5 to 14 September 1973. Approximately 110 participants from 14 countries attended. Principal subject matter cover was: dc Machines and Propulsion; Transmission of Electrical Energy; High Field Magnet Research and Development; Practical Superconducting Materials; High Speed Magnetic Levitation and Propulsion; Present Large Scale Applications of Superconductors; ac Machines and Cryogenics. Author (GRA)

N74-22327# National Academy of Sciences - National Research Council, Washington, D.C.
PHYSICS IN PERSPECTIVE. VOLUME 2, PART C: STATISTICAL DATA (AUXILIARY MATERIAL COLLECTED BY THE STAFF AND SOME MEMBERS OF THE DATA PANEL)
1973 325 p refs
(AD-772540) Avail: NTIS CSCL 05/1

Contents: Manpower data; Data on funding and costs; Data on the literature of physics; Index of data; Selected tables from the physics portion of the national register of scientific and technical personnel; Allocation of national register specialties to physics subfields. GRA

N74-22328# Nebraska Univ., Lincoln. Dept. of Electrical Engineering.
APPLICATIONS OF 'SLOW' MODES FOR ACTIVE ELEMENTS IN INTEGRATED OPTICS Annual Report, 1 Jan. - 31 Dec. 1973
Alvin B. Buckman 31 Dec. 1973 43 p refs
(Contract N00014-70-A-1235-0002; NR Proj. 009-004)
(AD-774935) Avail: NTIS CSCL 20/6

Studies of slow guided modes on partially metallic, multifilm waveguides show that, while losses with such modes are too large (1/e decay distances of 100 wavelengths or less) to use these devices as integrated modulators, their unique feature of high field concentration in a very thin metal film makes them attractive as integrated optical bolometers. Multifilm, all-dielectric waveguides can increase the efficiency of integrated optical modulators by at least 60%. Films evaporated from PbI2 are found to be damaged by Ar ion laser radiation at power densities as low as 50 mw/sq cm, for exposures of about one hour. The damage takes the form of a refractive index change of the order of 1-10%, and appears permanent. Author (GRA)

N74-22329# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENT TO MEASURE LASER BEAM WANDER AND BEAM SPREAD IN THE MARINE BOUNDARY LAYER NEAR SHORE M.S. Thesis
David Albert Beall Dec. 1973 96 p refs
(AD-775027) Avail: NTIS CSCL 20/6

A system to measure laser beam wander and beam spread in the atmosphere over the ocean has been designed, constructed, and tested. The apparatus employed a high resolution scanning telescope with a potential for use in a broad range of visual and infra-red wavelengths, and with the ability to measure beam wander and beam spread variations on the order of a few microradians in angle of incidence. Three successful trials with a propagation path over the southern end of Monterey Bay were conducted. Data was processed using analog and digital computers. RMS values of beam wander from 4.6 to 30.2 microradians were observed. Author (GRA)

N74-22330# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF SYSTEMATIC ERRORS IN MEASURING ACCELERATION DUE TO FORCE OF GRAVITY USING THE FREE-FALL METHOD
G. P. Arnautov, L. D. Gik, Ye. N. Kalish, and Yu. P. Stus 1 Feb. 1974 15 p Transl. into ENGLISH from the monograph "Izmerenie Absolyutnogo Znacheniya Gravitatsionnogo Uskoreniya" USSR, 1972 p 37-47
(AD-775137; FTD-HT-23-767-74) Avail: NTIS CSCL 20/11

Sources of systematic error in free fall method are non gravitational in origin (air stagnation force F sub, T electrostatic F sub 3, and magnetic F sub m forces). Another possibility is systematic effect from seismic impact, tested by gravimeter at the instant of releasing the falling body. When measuring the path covered by the body using a laser interferometer the effect of nonverticality of the laser beam, effect from rotation of the optical center pf the reflector relative to the center of the mass of the falling body F sub 8p and Doppler change of wavelength of the laser emission must all be considered. Thus the equation of motion has the following form: mZ=M(G sub o-V sub zz Z)-F sub t=F sub m-F sub 3-F sub 8p. Author

N74-22331# Westinghouse Research Labs., Pittsburgh, Pa.
SUPERCONDUCTING WINDINGS Annual Report, 1 May - 3 Dec. 1973
Michael S. Walker and John H. Murphy 26 Feb. 1974 30 p refs
(Contract N00014-73-C-0461; NR Proj. 319-068)
(AD-775573; Rept-74-9J2-CRYEL-R1; AR-1) Avail: NTIS CSCL 20/3

A schedule of the work accomplished under the program is presented with relevant discussion. Data and details are provided in Appendices. The loss behavior of superconductors was examined for alternating fields superimposed upon fixed bias fields simulating the field conditions that might be observed in a machine. An extensive set of measurments on one practical superconductor has been completed, and measurements on several other conductors have been initiated. A parallel effort has been sustained to extend the theory of losses under these field conditions. Author (GRA)

N74-22332# Hughes Research Labs., Malibu, Calif.
INTEGRATED OPTICS
G. Sanjiv Kamath, Ammon Yariv, Michael Barnoski, Kyohei Sakuda, and Victor Evtuhov Aug. 1973 78 p refs
(Contract F19628-72-C-0322; ARPA Order 2074; AF Proj. 2074)

(AD-775067; AFCRL-TR-73-0713) Avail: NTIS CSCL 20/6

The objectives of this contract are to study and analyze the propagation, attenuation, and modulation of coherent optical waves in thin film waveguides, in particular epitaxial semiconductor structures at a wavelength of 8500A, to determine the parameters controlling the solution regrowth epitaxy of the Ga(1-x)Al(x)As system, to study the influence of the index discontinuity and semiconductor carrier concentration on optical properties, and to develop the elementary optical device elements. The present program may be viewed as consisting of the following elements: (1) establishment of epilayer material and structure requirements from the device point of view, (2) development of materials growth techniques, (3) materials evaluation, and (4) device analysis and fabrication techniques.
GRA

N74-22333# Hebrew Univ., Jerusalem (Israel). Dept. of Inorganic and Analytical Chemistry.

ENERGY TRANSFER BETWEEN INORGANIC IONS IN GLASSES Final Technical Report, 15 Nov. 1972 - 14 Nov. 1973

Renata Reisfeld Nov. 1973 39 p refs

(Contract DAJA37-73-C-1581; DA Proj. 2O0-61102-B-13B) (AD-775425; FTR-15) CSCL 07/4

Inorganic glasses doped by rare earth Gd(3+),Eu(3+), Sm(3+), Tb(3+),Tm(3+),Fr(3+) and lead ions were prepared. Intensity parameters and probabilities of radiative electronic transitions were calculated from the experimentally obtained fluorescence and absorption spectra. Nonradiative transition probabilities between various electronic levels were obtained from the quantum yields of the fluorescence and fluorescence life-times. A connection was found between the phonon energies of the glasses and the luminescence quantum yields of rare earth ions incorporated in these glasses. The amount of covalency between a given glass and a heavy metal ion was obtained from a study of optical characteristics of divalent lead in various glasses. A connection has been found between the nephelauxetic effect and electronegativity of the glasses. The probability of energy transfer between gadolinium and samarium was measured in borate glasses and the mechanism of transfer suggested. (Modified author abstract) GRA

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-22334*# Washington Univ., St. Louis, Mo. Lab. for Space Physics.

TESTING OF MODELS OF VVH PARTICLE SOURCES AND PROPAGATION

G. E. Blanford, Jr. [1972] 10 p refs

(Grants NGR-26-008-001)

(NASA-CR-138158) Avail: NTIS HC $4.00 CSCL 20H

For comparisons between theoretical and observed charge spectra of the VVH particles to be meaningful, at least two conditions must be met. First, charge resolution must be adequate to separate important groups of nuclei, and there should be no significant systematic errors in the charge scale developed. Second, there must be adequate rejection of slower particles of smaller Z, which have been observed in several flights. Within these conditions, it has been shown that observed features of the charge spectrum are not accidents of the analysis but reflect real variations in the relative abundances that must be explained by any successful model. Author

N74-22335*# Washington Univ., St. Louis, Mo. Lab. of Space Physics.

PRIMARY COSMIC RAY PARTICLES WITH Z > 35 (VVH PARTICLES)

G. E. Blanford, Jr., M. W. Friedlander, M. Hoppe, J. Klarmann, R. M. Walker, and J. P. Wefel [1972] 10 p refs

(Grants NGR-26-008-001)

(NASA-CR-138157) Avail: NTIS HC $4.00 CSCL 20H

Large areas of nuclear emulsions and plastic detectors were exposed to the primary cosmic radiation during high altitude balloon flights. From the analysis of 141 particle tracks recorded during a total exposure of 1.3 x 10 to the 7th power sq m ster.sec., a charge spectrum of the VVH particles has been derived. Author

N74-22336*# Tennessee Univ., Knoxville. Earth Resources and Astrophysics Lab.

Nu sub 1 PLUS nu sub 3 COMBINATION BAND OF SO2

R. J. Corice, Jr., K. Fox, and G. D. T. Tejwani Dec. 1972 17 p refs

(Grant NGL-43-001-021)

(NASA-CR-138119; UTPA-ERAL-03) Avail: NTIS HC $4.00 CSCL 20H

The infrared-active vibration-rotation combination band nu sub 1 + nu sub 3 of sulfur dioxide was measured with moderately high spectral resolution. Quantum number identifications of spectral lines were made by comparison with theoretically computed spectra which include the effects of centrifugal distortion. Relative line intensities were also calculated. The band center for nu sub 1 + nu sub 3 was determined to be 2499.60 + or - 0.10/cm. Author

N74-22337# Maryland Univ., College Park. Center for Theoretical Physics.

DUAL SCATTERING OF PARTICLES AND POMERANCHUKONS

L. Clavelli Mar. 1974 21 p refs

(Grant NSF GP-20709)

(TR-74-076) Avail: NTIS HC $4.25

An SU(1,1) invariant vertex is proposed for the emission of Pomeranchuk resonances in the generalized Veneziano model. Known amplitudes for the decay of spin L Pomeranchukons on the leading trajectory are recovered and an integral representation is given for multi-Pomeranchukon-Reggeon N point functions. The Regge limits of elastic Pomeranchuk particle scattering are investigated. Applications to inclusive reactions are suggested.
Author

N74-22338# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).

A GAUGE THEORY OF WEAK AND ELECTROMAGNETIC INTERACTIONS WITH SPONTANEOUS PARITY BREAKING

P. Fayet Feb. 1974 26 p refs

(LPTHE-74/9) Avail: NTIS HC $4.50

A unified gauge theory of weak and electromagnetic interactions in which parity is spontaneously broken together with gauge invariance, by the Higgs mechanism is presented. The gauge group is SU(2) x U(1), and a heavy neutrino is associated with every charged lepton. After the breaking of the original parity-conserving theory, both a purely vector electromagnetic current and the usual V-A charged currents are obtained. The Z is coupled to a vector electron current, and the model predicts equal mu-neutrino electron and mu-antineutrino electron cross sections. Extension to hadrons is made by introducing three charmed quarks p', n' and Lambda of the same charges as p, n and Lambda. All the experimental results are compatible with a value of Sin2 theta sub w of order .4. Author

N74-22339# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).

A STUDY OF NEUTRINO-PRODUCTION OF NUCLEON ISOBARS IN THE QUARK MODEL

P. Andreadis, A. Baltas, A. LeYaouanc, L. Oliver, O. Pene, and J. C. Raynal Jan. 1974 76 p refs

(LPTHE-74/5) Avail: NTIS HC $7.00

A complete description of the predictions of the harmonic oscillator quark model for the process neutrino nuclear yields muon nuclear isobars, based on multipole expansion, is given. General formulae are obtained for the reduced matrix elements of the multipole operators. A yet unformulated set of selection rules for the axial part of the matrix element is thus obtained. Owing to the presence of large momentum transfers, a relativistic treatment of the hadron center of mass motion is introduced, which consists in boosting the SU(6) harmonic oscillator wave

functions at rest. The physical structure of the quark weak current is described by the dominance of the corresponding intermediate bound states rho meson and pion, A1 meson. Quantitative predictions are obtained for multipole amplitudes, cross-sections and density matrices, without any free parameter. Author

N74-22340*# Pittsburgh Univ., Pa. Dept. of Physics.
MEASUREMENTS OF ION-MOLECULE REACTIONS OF He PLUS, H PLUS, HeH PLUS WITH H sub 2 AND D sub 2
Rainer Johnsen and Manfred A. Biondi Apr. 1974 15 p refs Submitted for publication
(Grant NGR-39-011-137)
(NASA-CR-138190; APP-45; SRCC-201) Avail: NTIS HC $4.00 CSCL 20H

A drift tube mass spectrometer apparatus has been used to determine the rate coefficient, energy dependence and product ions of the reaction He(+) +H2. The total rate coefficient at 300 K is 1.1 plus or minus 0.1) 10 to minus 13th power cu cm/sec. The reaction proceeds principally by dissociative charge transfer to produce H(+), with the small remainder going by charge transfer to produce H2(+) and by atom rearrangement to produce HeH(+). The rate coefficient increases slowly with increasing ion mean energy, reaching a value of 2.8 x ten to the minus 13th power cu cm sec at 0.18 eV. The corresponding reaction with deuterium, He(+) + D2, exhibits a value (5 plus or minus 1) x 10 to the minus 14th cu cm/sec at 300K. The reaction rates for conversion of H(+) and HeH(+) to H3(+) on collisions with H2 molecules are found to agree well with results of previous investigations. Author

N74-22341*# Scientific Translation Service, Santa Barbara, Calif.
THEORY OF RADIATION GENERATED BY CHARGED PARTICLES PASSING THROUGH CONTINUOUS PERIODIC MEDIUM
G. M. Garibian and Yang Chi Washington Jul. 1973 31 p refs Transl. into ENGLISH of "Teoriya Izlucheniya Voznikayushchego pri Prokhodzhenii Zaryazhennoy Chastitsy Cherez Nepreryvnyyu Periodicheskuyu Sredu," Yerevan Physics Inst., YeFM-16(73), 1973 33 p
(Contract NASw-2483)
(NASA-TT-F-14726; YeFM-16(73)) Avail: NTIS HC $4.75 CSCL 20H

The problem of charge emission in a continuous periodic medium by means of a changed perturbation theory is examined. General equations for an infinite periodic medium are given, as well as the solution of a homogeneous equation. Author

N74-22342*# Linguistic Systems, Inc., Cambridge, Mass.
LIGHT EMISSION IN THE VACUUM ULTRAVIOLET THROUGH ELECTRON COLLISION EXCITATION IN GASES. PART A: INVESTIGATIONS IN OXYGEN
W. Sroka Washington NASA Apr. 1973 22 p refs Transl. into ENGLISH from Z. Naturforsch. (Tubingen), v. 23, 1968 p 2004-2013
(Contract NASw-2482)
(NASA-TT-F-14728) HC $4.25 CSCL 20H

A nearly monochromatic electron beam of low energy (0 to 200 eV) interacts with molecules of a gas (O2, N2, etc). The radiation emitted in this collision process is observed with a vacuum monochromator. The registered wave-length can be attributed to known transitions. Excitation functions and the appearance potentials of these processes are measured. It is found that the electrons dissociate the molecules in a single collision into excited atoms or ions which emit a radiation in the vacuum ultraviolet. Furthermore it is shown that the above mentioned processes also appear in low current corona discharges and in non-self-sustaining discharges in the homogeneous electric field. The origin of the so-called gas ionizing radiation is found to be a dissociation process combined with an excitation of the dissociation products. Author

N74-22343*# Linguistic Systems, Inc., Cambridge, Mass.
PREDISSOCIATION IN AN ELECTRIC FIELD: A NEW PHENOMENON IN MOLECULAR SPECTROSCOPY
F. J. Comes and U. Wenning Washington NASA Apr. 1973 16 p refs Transl. into ENGLISH from Z. Naturforsch. (Tubingen), v. 23a, 1970 p 406-411
(Contract NASw-2482)
(NASA-TT-F-14729) Avail: NTIS HC $4.00 CSCL 20H

Molecules in certain excited states can be forced to predissociate in an external electric field. This effect will be shown to occur with H2 and D2. The molecular dissociation is made possible by an altered coupling mechanism as compared to the mechanism considered for the Kronig's selection rules. The interaction is a linear function of the fields (Van Der Waal's fields) may cause the effect which is shown by the collision induced predissociation of the excited molecular states under consideration. Author

N74-22344*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A STOKES' VELOCITY PHOTOGRAPHIC METHOD FOR MEASURING THE SIZE DISTRIBUTION OF AEROSOLS
Adarsh Deepak 21 Feb. 1974 23 p refs
(NASA-TM-X-64838) Avail: NTIS HC $4.25 CSCL 20H

Aerosol particles are allowed to settle in a vertical glass walled vessel, and their settling velocity is determined by photographing them while the light entering the camera is being chopped at a known rate. The settling velocity of each particle can be determined from the photographs, and by applying the Stokes' law, one can calculate the radius of each particle. The Stokes' law for a sphere settling freely in a quiet medium is given. If the volume of the photographed region of the illumination is known, the aerosol number density and size distribution can be obtained. Experiments with alumina particles of given size distributions indicate that the method works accurately. One set of a typical experiment with 3.0-micrometer Al2O3 particles is presented, which shows that the measured size distribution peaks at approximately 3.0 micrometer. Author

N74-22345*# New York Univ., N.Y.
MODEL CALCULATIONS FOR DIFFUSE MOLECULAR CLOUDS
A. E. Glassgold and William D. Langer [1974] 69 p refs
(Grant NGR-33-016-0196)
(NASA-CR-138186) Avail: NTIS HC $6.50 CSCL 20H

A steady state isobaric cloud model is developed. The pressure, thermal, electrical, and chemical balance equations are solved simultaneously with a simple one dimensional approximation to the equation of radiative transfer appropriate to diffuse clouds. Cooling is mainly by CII fine structure transitions, and a variety of heating mechanisms are considered. Particular attention is given to the abundance variation of H2. Inhomogeneous density distributions are obtained because of the attenuation of the interstellar UV field and the conversion from atomic to molecular hyrodgen. The effects of changing the model parameters are described and the applicability of the model to OAO-3 observations is discussed. Good qualitative agreement with the fractional H2 abundance determinations has been obtained. The observed kinetic temperatures near 80 K can also be achieved by grain photoelectron heating. The problem of the electron density is solved taking special account of the various hydrogen ions as well as heavier ones. Author

N74-22346# Commissariat a l'Energie Atomique, Saclay (France).
EFFECT OF THE SCATTERING OF ELECTRONS ON THE DISTRIBUTION FUNCTION AND THE BALANCE OF ELECTRONIC ENERGY IN POST-DISCHARGE HELIUM
P. Monchicourt, M. Touzeau, and W. E. Wells 24 May 1973 19 p refs In FRENCH Presented at the Congr. on the Centenary of the French Phys. Soc., Vittel, France, 28 May - 2 Jun. 1973 (CEA-Conf-2371; Conf-730574-6) Avail: AEC Depository Libraries HC $3.00

The deexcitation of metastable atoms and molecules in the afterglow of a weakly ionized helium gas leads to the creation of hot electrons having energies of between 15 and 20 eV. The energy relaxation of these electrons was studied under conditions where the diffusion is not negligible. The expression for the coefficient of diffusion together with considerations on the space change created by the total electron energy distribution enables calculations to be made of the number of electrons disappearing during the relaxation process and the perturbation resulting in the Maxwellian distribution.. NSA

N74-22347# Rochester Univ., N.Y. Dept. of Physics and Astronomy.
SPONTANEOUS HIGH INTENSITY PULSE EFFECTS Final Report, 1 Jun. 1970 - 31 May 1972
Joseph H. Eberly Feb. 1974 13 p refs
(Grant DA-ARO(D)-31-124-70-G86; AROD Proj. 8915-P)
(AD-775517; AROD-8915-12-P) Avail: NTIS CSCL 07/4

The report presents a summary of investigations concerned with experimentally relevant restrictions on peak power radiated by many excited atoms. In particular, the atoms are spread over a macroscopic volume and are subject to inhomogeneous broadening of the atomic lineshape. Author (GRA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-22348 Institute of Plasma Physics, Prague (Czechoslovakia). Inst. of Plasma Physics.
THE EFFICIENT INJECT OF GREAT MICROWAVE POWERS INTO THE OVERDENSE MAGNETOACTIVE PLASMA IN THE WAVEGUIDE
J. Musil, F. Zacek, and V. N. Budnikov Dec. 1972 17 p refs
(IPPCZ-176) Avail: Issuing Activity

The relationships between incident wave frequency, plasma frequency, and electron cyclotron frequency to produce a strong reflection of the incident right hand circularly polarized wave are discussed. The reflection greatly lowers the efficiency of the plasma heating by microwaves. An experimental study shows that a suitable matching system consisting of dielectric plates, placed in front of the plasma, can ensure practically complete transfer of the right hand circularly polarized wave energy into a dense plasma. The experiment was conducted in an S band waveguide with one kilowatt power. Author

N74-22349 Institute of Plasma Physics, Prague (Czechoslovakia). Inst. of Plasma Physics.
THE ENERGY-MOMENTUM TENSOR FOR AN ELECTRO-MAGNETIC WAVE IN PLASMA, PART 1. ON THE MASS OF A WAVE PACKET IN PLASMA, PART 2
R. Klima and V. A. Petrzilka Jan. 1973 15 p refs Submitted for publication
(IPPCZ-172-Pt-1-2) Avail: Issuing Activity

The energy-momentum tensor is derived for a plane quasimonochromatic wave packet of an electromagnetic wave in cold collisionless non-magnetized plasma. A comparison with previous results indicates the relevance of the nonlinear motion in the direction of wave propagation. Author

N74-22350 Institute of Plasma Physics, Prague (Czechoslovakia).
NONLINEAR WAVES IN A WAVEGUIDE PARTIALLY FILLED WITH A PLASMA
V. A. Petrzilka Dec. 1972 14 p refs
(IPPCZ-177) HC $4.00

Nonlinear waves were studied in a circular waveguide partially filled with a cold magnetized collisionless plasma. The solution obtained is periodical with the frequency increasing as a square root of the amplitude of the solution in the first approximation. Author

N74-22351 Institute of Plasma Physics, Prague (Czechoslovakia). Inst. of Plasma Physics.
NONLINEAR BEAM-PLASMA INTERACTION
K. Jungwirth and P. Sunka Jun. 1973 64 p refs
(IPPCZ-181) Avail: Issuing Activity

The nonlinear evolution of the high frequency instabilities excited by an electron beam in a magnetized plasma has been investigated both theoretically and experimentally. Only the Cerenkov type of excitation of the electron plasma oscillations has been observed. By using the energy and momentum conservation laws, the equations describing the development of the amplitude and phase of the most unstable wave are derived both in the temporal and spatial problem and then solved numerically, together with the equations of the beam particles motion. The dominant role of an absorption (transformation) of the wave for its interaction with a beam modulated at a frequency belonging to the upper branch of the electron plasma oscillations has been recognized on two models, the effective collision frequency being either constant or proportional to the wave amplitude. It can be seen from the calculated beam distribution functions that most of beam particles is trapped, bunched and permanently decelerated by the excited wave. Author

N74-22352*# Scientific Translation Service, Santa Barbara, Calif.
MEASUREMENT OF TURBULENT HF FIELDS IN A HIGH CURRENT RECTILINEAR GAS DISCHARGE FROM THE INTENSITY OF FORBIDDEN HeI LINES
G. V. Zelenin, A. A. Kutsyn, M. Ye. Maznichenko, O. S. Pavlichenko, and V. A. Suprunenko Washington NASA Apr. 1974 9 p refs Transl. into ENGLISH from Fiz. Plaz. Probl. Upr. Termoyad. Sin. Dokl. Konf. (Kharkov), no. 4, 1973 p 203-208
(Contract NASw-2483)
(NASA-TT-F-15524) Avail: NTIS HC $4.00 CSCL 20I

An investigation was made of satellites close to the forbidden line of HeI in the case of turbulent plasma heating in a high current rectilinear gas discharge. The plasma emission spectrum was also analyzed. E.H.W.

N74-22353*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF A PENNING DISCHARGE AT LOW PRESSURE
B. G. Safronov and V. G. Konovalov Washington NASA Apr. 1974 16 p refs Transl. into ENGLISH from Fiz. Plazmy Probl. Upr. Termoyad. Sin. (Kiev), no. 4, 1973 p 27-37
(Contract NASw-2481)
(NASA-TT-F-15523) Avail: NTIS HC $4.00 CSCL 20I

The diamagnetism of a Penning-discharge plasma was studied experimentally as a function of gas pressure, magnetic field strength, and applied voltage. Results show that the diamagnetism of the plasma and the uncompensated current circulating near the anode are strongly dependent on the applied voltage. The ratio of the circulating current to the discharge current decreases with increasing gas pressure. The estimated 300-microsec energetic lifetime of the plasma at 0.1 microtorr pressure is in good correlation with the ionizational collision rate. Cathode sputtering patterns are examined to evaluate the transverse component of ion energy. Author

N74-22354*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THERMAL RELAXATION OF A TWO DIMENSIONAL PLASMA IN A dc MAGNETIC FIELD. PART 1: THEORY
Hsu Jang-Yu, David Montgomery (Hunter Coll.), and Glenn Joyce Jan. 1974 15 p refs
(Grant NGL-16-001-043; Contract AT(11-1)-2059)
(NASA-CR-138170; U-of-Iowa-74-1-Pt-1) Avail: NTIS HC $4.00 CSCL 20I

A theory is presented for the rate of thermal relaxation of a two dimensional plasma in a strong uniform dc magnetic field. The Vahala - Montgomery kinetic description is completed by providing a cut off time for the time of interaction of two particles which contribute to the collision term. The kinetic equation predicts that thermal relaxation occurs as a function of the dimensionless time. By contrast, in the absence of an external magnetic field, a two dimensional plasma relaxes. Author

N74-22355*# California Univ., San Diego.
BEHAVIOR OF THERMAL PLASMA IN THE IONOSPHERE AND MAGNETOSPHERE Final Technical Report
P. M. Banks and J. R. Doupnik 13 Nov. 1973 74 p refs
(Grant NGR-05-009-180)
(NASA-CR-138115) Avail: NTIS HC $6.75 CSCL 20I

Models of ion flow in the topside ionosphere were developed. These models took both H(+) and O(+) into account and permitted various parameter studies to be made affecting H(+) escape in polar winds. Extensive computer programs were written to display the measured electron density profiles in ways useful to geophysical analysis. The relationship between the location of the plasmapause as it is found in the equatorial plane and the location of the ionospheric trough was also investigated. J.A.M.

N74-22356# Joint Publications Research Service, Arlington, Va.

STUDY OF THE STRUCTURE OF A THERMONUCLEAR COMBUSTION FRONT IN A LAYER OF PLASMA CONFINED BY PHYSICAL WALLS

A. F. Nastoyashchiy and L. P. Shevchenko 10 May 1974 35 p refs Transl. into ENGLISH of "Issled. Strukt. Termoyadernoy Volny Goreniya v Sloye Plazmy, Uderzhivayemoy Materialnymi Stenkami, (Moscow), Order of Lenin Inst. of Atomic Energy imeni I. V. Kurchatou, 1972

(JPRS-61956) Avail: NTIS HC $4.75

Data are presented on an investigation of the conditions for the existence, the speed of propagation, and the structure of the combustion front of a thermonuclear wave in an infinite layer of plasma confined by heavy physical walls. Matching of approximate analytical solutions for hot and cold plasma, phase plane techniques, and numerical methods are used in the investigation. Author

N74-22357# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.

EXAMINATION OF THE PHYSICAL AND SPECTROCHEMICAL CONDITIONS OF THE ARC DISCHARGE UNDER INERT GAS PRESSURE UP TO 40 ATMOSPHERES

G. Keintzel Jul. 1973 113 p refs In GERMAN; ENGLISH summary

(JUL-973-RW) Avail: AEC Depository Libraries HC $7.75

Examinations with a dc arc at high pressure showed that the discharge in a helium atmosphere, compared to argon, is accompanied by convection-effected instabilities. They occur at pressure > 20 atm He, and in analytic work, they are responsible for an insufficient consistency of the spectrochemical results. A considerable improvement of the reproducibility can be obtained by installing a homogeneous, longitudinal magnetic field, since at field intensities between 100 and 200 G a stabilization of the arc discharge occurs. Under these conditions it is possible to perform a quantitative, spectrochemical analysis in a helium atmosphere up to 40 atm. The higher ionization potential of helium, compared to argon, causes a higher arc-operating voltage and a greater electric field intensity in the discharge space. Author (NSA)

N74-22358# Paris Univ., Orsay (France).

MICROWAVE PARAMETRIC AMPLIFICATION IN GAS PLASMAS AND ELECTRON BEAMS Ph.D. Thesis - Paris Univ., Orsay

M. Naoulo 1972 208 p refs In FRENCH

(FRNC-TH-400) Avail: AEC Depository Libraries HC $6.75

A theory is developed for the parametric amplification of traveling waves which takes into account the existence of a finite-valued confining magnetic field as well as the radial and azimuthal motion of the electrons. Three cases are dealt with: an electron beam, a plasma column, and a mixed beam-plasma system. The beam-plasma system is a cylindrical column of finite radius maintained under vacuum. The ionized gas is modulated by pump. The signal which is subsequently injected is amplified by coupling it with the pump, this being possible as a result of the nonlinear properties of the system. Linear analysis of the dispersion yields the propagation parameters of the separately injected waves. The simultaneous excitation modifies these parameters. An analysis of the propagation of the waves, taking into account second-order nonlinear terms, enables the nonlinear component of the current density to be obtained.

Author (NSA)

N74-22359# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.

WAVE-PLASMA INTERACTION NEAR THE LOWER HYBRID FREQUENCY Ph. D. Thesis - Paris Univ., Orsay

S. Pesic Jul. 1973 216 p refs In FRENCH; ENGLISH summary

(EUR-CEA-FC-700) Avail: AEC Depository Libraries HC $13.00

A theoretical and experimental study of wave-plasma interaction near the lower hybrid frequency is presented. The propagation properties of the resonant electromagnetic mode, the waves in an inhomogeneous cold plasma column, the wave coupling near the lower hybrid resonance, the damping of plasma waves, the efficiency of the lower hybrid heating, and the coupling with an external hf source were investigated. The lower hybrid resonance phenomenon was demonstrated in the Chimere experiment. The results obtained indicate that the lower hybrid plasma heating is a fast and efficient process. Its application in a plasma close to thermonuclear conditions seems very interesting. NSA

N74-22360# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.

METHODS OF MEASUREMENT FOR THE STUDY OF PLASMA IN THE TFR

C. Etievant 28 May 1973 60 p refs In FRENCH; ENGLISH summary Presented at the Congr. on the centenary of the French Phys. Soc., Vittel, France, 28 May - 2 Jun. 1973

(CEA-Conf-2432; Conf-730574-3) Avail: AEC Depository Libraries HC $5.00

Plasma diagnostic methods used to study the main parameters of the plasma confined in the TFR (electron and ion temperature, current density), the electrical behavior of the discharge, the densities of neutral gas and impurities, and the parameters of plasma turbulence are presented. NSA

N74-22361# Massachusetts Inst. of Tech., Cambridge.

THEORY OF DRIFT-UNIVERSAL AND DRIFT CONE MODES OF COLLISIONLESS PLASMA IN CYLINDRICAL GEOMETRY Ph.D. Thesis

R. L. McCrory, Jr. Jun. 1973 174 p refs

(Contract AT(11-1)-2168)

(TID-26472) Avail: NTIS HC $10.75

The collisionless electrostatic drift universal and flute-like drift cone instabilities of a hot, fully ionized plasma in a magnetic field in cylindrical geometry are considered. A discussion is given of the validity of the electrostatic approximation, and the restrictions of the electrostatic assumption on the value of beta (ratio of plasma pressure to magnetic pressure). The work introduces a rigorous kinetic formulation of the radial eigenmode problem of a collisionless plasma in cylindrical geometry. The cylindrical model includes, in principle, those sources of free energy available to drive microinstabilities inherent in many plasma confinement devices, viz, radially varying density gradients, temperature gradients and temperature anisotropies in the directions perpendicular and parallel to the magnetic lines of force; and velocity space loss cone-like distribution functions common to mirror devices. Author (NSA)

N74-22362# Sandia Labs., Albuquerque, N.Mex.

CALCULATIONS RELATING TO SELF-GENERATED MAGNETIC FIELD MEASUREMENTS IN LASER PLASMAS

M. M. Widner 1973 12 p Presented at Ann. Plasma Phys. Meeting of the Am. Phys. Soc., Philadelphia, 31 Oct. 1973 Sponsored by AEC

(SLA-73-5694; Conf-731009-4) Avail: NTIS HC $3.00

Calculations are described that explain many qualitative features of spontaneous magnetic field measurements. Fields of 1 to 1000 G were measured in a number of reported experiments using magnetic probes. These probes are located on the order of 1 cm from the target. On the other hand, numerical simulation of laser plasmas indicates much larger magnetic fields can be produced near the target. The relationship between the probe measurements and the calculated large fields near the target is examined. Author (NSA)

N74-22363# Cornell Univ., Ithaca, N.Y. Lab. of Plasma Studies.

DIFFUSION THEORY OF STRONG, STABLE E LAYERS

S. Humphries, Jr. May 1973 26 p refs

(Contract AT(11-1)-3170)

(LPS-117) Avail: NTIS HC $3.50

A diffusion theory is presented that treats the long term behavior of strong electron rings (E layers) with and without an applied toroidal field. Loss rates and decay characteristics are predicted that are in good agreement with experimental results from the Astron and the Cornell relativistic electron coil experiment. Self consistent density distributions and changes of the E-layer energy are also discussed. The average radius of the layer as a

function of energy, magnetic fields, and surrounding conducting boundaries is calculated for typical experimental situations.
Author (NSA)

N74-22364# Oak Ridge National Lab., Tenn. Reactor Div.
MATERIALS PROBLEMS IN THE DESIGN OF MAGNETICALLY CONFINED PLASMA FUSION REACTOR
A. P. Fraas 1973 23 p refs Presented at Joint Meeting of the Am. Nucl. Soc. and the Atomic Ind. Forum and Nucl. Energy Exhibition, San Francisco, 11-16 Nov. 1973 Sponsored by AEC
(Conf-731101-32) Avail: NTIS HC $3.25

Materials engineering problems are discussed for the following areas: superconducting magnets, tritium breeding, structural materials, radiation damage, electrical insulating materials, tritium problems, hydrogen diffusion barrier, remote fabrication, thermal insulation, and magnet shield. NSA

N74-22365# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
RELAXATION RATE OF A TWO DIMENSIONAL MAGNETIZED PLASMA MODEL M.S. Thesis
J. Hsu Dec. 1973 79 p refs
(Contract AT(11-1)-2059)
(COO-2059-28) Avail: NTIS HC $6.00

The thermal relaxation of a two-dimensional single-species plasma model is investigated. The numerical results in the unmagnetized case are consistent with those of Montgomery and Nielson when the mesh size of the computational grids is equal to a Debye length. It is shown that a smaller mesh size makes the relaxation faster. The secular term in the kinetic equation arising from the calculation of the energy exchange of a two-particle system along the unperturbed orbit is well interpreted and overcome by the introduction of the drift of the guiding center. For weak magnetic fields, the pair correlation is enhanced and makes the relaxation time shorter than that in the absence of a magnetic field. Author (NSA)

N74-22366# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
PLASMA CONFINEMENT IN PRESENCE OF MAGNETICALLY SHIELDED SUPPORTS
B. Lehnert Dec. 1973 60 p refs
(Rept-73-19) Avail: NTIS HC $6.00

Recent investigations of plasma confinement by internal ring systems with magnetically shielded supports led to contradictory conclusions. Support shielding is considered in terms of the problems of plasma cut-off at the support surfaces, the plasma equilibrium in presence of the support field, nonadiabatic effects on transit and trapped particles, and magnetic field misalignment in the weak-field regions. H is shown that the confinement properties of shielded support system are sensitive to the choice of the parameter involved. Author (ESRO)

N74-22367# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
ON PLASMA HEATING IN INTERNAL RING SYSTEMS WITH SHIELDED SUPPORTS
B. Lehnert 10 Jan. 1974 13 p refs
(TRITA-EPP-74-01) Avail: NTIS HC $4.00

The heating methods applied to quasi-steady impermeable plasmas confined in the purely poloidal field of internal ring systems with magnetically shielded supports are discussed. Two mechanisms fulfill the requirements of efficient heating at moderately high plasma temperatures. Low-frequency Ohmic heating by induced poloidal currents flowing along the magnetic field lines is discussed. Author (ESRO)

N74-22368# Avco-Everett Research Lab., Everett, Mass.
INVESTIGATION OF THE PRODUCTION OF HIGH DENSITY UNIFORM PLASMAS
R. Patrick and D. Douglas-Hamilton Jan. 1974 47 p refs
(Contract F44620-70-C-0023; AF Proj. 9752)
(AD-775099; AFOSR-74-0194TR) Avail: NTIS CSCL 20/9

A stable high-pressure electric discharge is produced using an electron beam to ionize the gas. The attachment instability in the discharge, discovered under this program, has been investigated in the gas mixtures (He:CO2:H2O) = (74:0:2), (9:1:0), (1:1:0) (mole fraction) and a theory predicting the instability has been derived. Experimental measurements of the discharge parameters for instability onset agree well with theoretical predictions. It appears that the onset of discharge arcing may be associated with this phenomenon, and theoretical understanding of it is expected to be of considerable importance in electric discharge gas laser systems. Author (GRA)

N74-22369# Harry Diamond Labs., Washington, D.C.
SIMULATION OF A SIMPLE LORENTZ PLASMA WITH A RANDOM DISTRIBUTION OF INDUCTIVELY LOADED DIPOLES
George Merkel Nov. 1973 45 p refs
(DNA Proj. NWET-R99WAXE; HDL Proj. E053E3)
(AD-775448; HDL-TR-1637) Avail: NTIS CSCL 20/9

The feasibility of simulating a simple Lorentz plasma with an artificial dielectric constructed from a random distribution of inductively loaded dipoles is investigated. Both the differences and similarities between the macroscopic electromagnetic properties of the artificial dielectric and Lorentz plasma are discussed. Author (GRA)

N74-22370# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INTERACTIONS OF FAST PARTICLES WITH THE WAVES OF MAGNETO-ACTIVE PLASMA
V. N. Tsytovich 14 Jan. 1974 45 p refs Transl. into ENGLISH from Akad. Nauk SSSR. Fiz. Inst. Preprint, no. 54, 1973 p 1-50
(AD-775322; FTD-HT-23-203-74) Avail: NTIS CSCL 20/9

Experimental data regarding the temperature movements, and other characteristics of a turbulent plasma by studying the width of spectral lines are presented. Data are also given on the use of the Saha equation to determine the degree of ionization in a turbulent plasma. Efforts were made to find a procedure to determine the degree of ionization in a turbulent plasma when the Saha equation is ineffective. E.H.W.

N74-22371# Rensselaer Polytechnic Inst., Troy, N.Y. Plasma Dynamics Lab.
AN ION BEAM PROBE DIAGNOSTIC TECHNIQUE FOR LABORATORY PLASMAS Ph.D. Thesis
Robert E. Reinovsky Aug. 1973 293 p refs
(Grant AF-AFOSR-2191-72; AF Proj. 9752)
(AD-775051; RPDL-73-13; AFOSR-74-0242TR) Avail: NTIS CSCL 20/9

Ion beam probing has been shown to be a general purpose diagnostic tool for magnetically confined plasmas. A complete system was designed, constructed, and operated on a number of laboratory plasmas to demonstrate the applicability of beam proving to laboratory devices. The results demonstrate that the advantages of ion beam probing can be achieved with modest expenditure of time and resources. The various components of a complete beam probe system have been investigated theoretically and experimentally for the first time. The results show that the beam probe system is dominated by electron impact ionization, as expected, that simple detectors have several limitations, and that the feedback controlled electrostatic energy analyzer demonstrates the spatial and time resolution expected from the theoretical analysis. (Modified author abstract) GRA

N74-22372# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PASSAGE OF CURRENT THROUGH BOUNDARY LAYERS
V. Yu. Baranov, D. D. Malyuta, and F. R. Ulinich 1 Feb. 1974 24 p refs Transl. into ENGLISH from Teplofiz. Vysokikh Temperatur, Akad. Nauk SSSR (Moscow), v. 11, no. 3, May/Jun. 1973 p 457-467
(AD-775138; FTD-HT-23-698-74) Avail: NTIS CSCL 20/9

The drop in potential near an electrode in the presence of a cold boundary layer is studied theoretically and experimentally. The effect of a microarc on the gas-dynamic parameters in the channel of a MHD generator is analyzed. GRA

N74-22373# Missouri Univ., Rolla. Dept. of Physics.
ATOMIC BEAM PLASMA DIAGNOSTICS Annual Technical Report, 1 Nov. 1972 - 31 Oct. 1973
Kaare J. Nygaard 31 Dec. 1973 71 p refs

(Contract N00014-69-A-0141-0007; NR Proj. 099-402)
(AD-774948; ATR-1) Avail: NTIS CSCL 20/9

The report is concerned with the application of atomic and ionic beams for measurement of electron density and temperature of fusion plasma. The average electron density is determined from the attenuation of an atomic beam. Spectroscopic line ratio measurements along the beam provide information about the electron temperature distribution. Single shot measurements can be made and the data handling automated with an Optical Multichannel Analyzer. The electron density distribution can best be measured with an ion beam. The plasma potential can be determined exactly from the energy difference between secondary and primary ions. Four appendices include completed research on photo- and electron-impact ionization as well as properties of GaAs lasers. Author (GRA)

N74-22374# Wisconsin Univ., Madison. Mathematics Research Center.

ON THE STRUCTURE OF MAGNETOHYDRODYNAMIC SHOCK WAVES

Joel A. Smoller and Charles C. Conley Feb. 1974 19 p refs
(Contract DA-31-124-ARO(D)-462; Grants NSF GP-2827; AF-AFOSR-2122-71)
(AD-775581; MRC-TSR-1336) Avail: NTIS CSCL 20/9

Fast and slow magnetohydrodynamic shock waves of arbitrary strength, for general equations of state and for arbitrary non-zero viscosity matrix, are shown to possess structure. Author (GRA)

N74-22375# Maryland Univ., College Park. Dept. of Physics and Astronomy.

PRODUCTION OF THERMONUCLEAR PLASMA BY ANOMALOUS DIFFUSION OF MAGNETIC FIELDS IN A HIGH VOLTAGE THETA PINCH Annual Summary Report

Nov. 1973 82 p refs
(Contract N00014-67-A-0239-0015; NR Proj. 099-395)
(AD-775548) Avail: NTIS CSCL 20/9

The report summarizes work done at the University of Maryland in the problem of plasma heating by application of a large amplitude magnetic pulse at the plasma boundary. The authors have been particularly interested in the ion heating resulting from drift instabilities and its scaline with initial plasma conditions. In the reporting period work was concentrated on measurements of X-ray intensities as an indication of electron temperature, and on electron heat loss processes. Attempts were made to directly measure ion energy spectra, and to measure electron densities. GRA

N74-22376# Joint Publications Research Service, Arlington, Va.

DIAGNOSTICS OF DENSE LASER PLASMAS AND SUPERDENSE HOT PLASMAS

Ye. V. Aglitskiy and A. V. Vinogradov 1 May 1974 34 p refs Transl. into ENGLISH from Acad. of Sci. USSR, P. N. Lebedev Phys. Inst., preprints no. 145 and 173 (Moscow), 1973
(JPRS-61878) Avail: NTIS HC $4.75

Methods are presented for determining the temperature and density of plasma produced by the sharp focusing of a laser beam onto the surface of a condensed material. Diagnostics of hot and very dense laser-produced plasmas are also included. Author

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-22377 Paris Univ. (France). Lab. de Physique des Solides.

APPLICATION OF THE TUNNEL EFFECT TO THE STUDY INTERFACE PHYSICS Final Report [UTILISATION DE L'EFFET TUNNEL A L'ETUDE DE LA PHYSIQUE DES INTERFACES]

E. Guyon Mar. 1973 15 p refs In FRENCH
(Contract DGRST-70-7-2421)
Avail: Issuing Activity

The tunnel effect for interface studies is presented. Emphasis is placed on pressure effects on rare earths thin films, Tomasch effect, proximity effects, and magnetic effects. Pressure effects are considered for Yb, In, Bi, GaAs, GaSb, and Ga As P between 14 and 30 Kbars, and results are discussed. The Tomasch effects were studied for a variety of bimetals of the N-S and S-N types. This effect is not sensitive to the total variation of the order parameter hence no significant improvement in regard to the usual proximity effect may by expected for interface study. The critical temperature increase in Al-Ge superconducting alloys is studied with a view to determining the influence of interface electronic mechanisms and the results are detailed. The proximity effect is studied with regard to the quality of N/S interfaces and transport properties of Cu/Pb in normal and superconducting states. Diluted magnetic alloys Cu X/Pb were also considered, and the results for various X(Mn,Cr,Fe,Co) are detailed. ESRO

N74-22378 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).

MAGNETIC LOSSES AT LOW AND HIGH UHF LEVEL IN SPINELS AND GARNETS Final Report [ETUDE DES PERTES MAGNETIQUES A BAS ET HAUT NIVEAU DE PUISSANCE UHF DANS DES SPINELLES ET GRENATS]

R. Inglebert Mar. 1973 71 p refs In FRENCH
(Contract DGRST-71-7-2842)
Avail: Issuing Activity

Magnetic losses in UHF for spinels and garnets are presented. For garnets doped with relaxation ions that do not modify the magnetocrystalline anisotropy, it is shown that the main resonant model line width increases at the same rate as an effective line width. For first order nonlinear effects (in relation to three magnon processes) the increase of the effective line width is proportional to the main resonant line width with a proportionality factor which depends on the doping ion. For fast relaxing ions (CO^{++}) where the anisotropy is perturbed no such relationships may be formed. However the power losses are intrinsically represented by the effective line width or the spin wave line width, but not by the mode resonance linewidth. Grain size influence is felt up to 10 microns and depends both on the doping ion and the crystal structure. ESRO

N74-22379 Paris Univ. (France). Lab. de Physique des Solides.

PHYSICAL CHARACTERIZATION OF IV-VI MATERIALS AND STUDY OF THE PHOTOVOLTAIC DETECTION AND THE RADIATIVE EMISSION OF Pb (1-X) SnxSe DIODES IN THE MEDIUM INFRARED Final Report [CONTROLE PHYSIQUE DE MATERIAUX IV-VI ET ETUDE DE LA DETECTION PHOTOVOLTAIQUE ET DE L'EMISSION RADIATIVE DES DIODES Pb (1-X) SnxSe DANS L'INFRAROUGE MOYEN]

M. Balkanski and J. M. Besson 1973 14 p refs In FRENCH
(Contract DGRST-71-7-2824)
Avail: Issuing Activity

The emission and detection properties of lead selenide junction diodes in the infrared medium are presented. Variations of temperature between 8 and 300 K and pressure variations up to 15 Kbar were used as parameters. The characterization of the junctions in terms of Hall effect, electrical resistivity, HF relaxation time, and radiative lifetime was performed. Diffusion characteristics and volt ampere characteristics of the junctions are discussed. The photodetection capability of the junctions is interpreted with regard to secondary radiative emission. The variation of the laser effect depending on pressure and temperature is detailed. The necessary requirements for achieving optimization of the photovoltaic and laser effects are specified with regard to emitted power, wavelength, temperature detectivity, and frequency response. ESRO

N74-22380 Centre National de la Recherche Scientifique, Bellevue (France). Lab. de Physique des Solides.

MAGNETIC SEMICONDUCTORS: FUNDAMENTAL STUDY AND POSSIBLE APPLICATIONS Final Report [SEMICONDUCTEURS MAGNETIQUES: ETUDE FONDAMENTALE ET POSSIBILITES D'APPLICATION COMPTE RENDU DE FIN DE CONTRAT]

P. Gibart, P. Leroux-Hugon, and C. Paparoditis Jan. 1973 19 p refs In FRENCH
(Contract DGRST-71-7-2603)
Avail: Issuing Activity

Fundamental studies relating to the preparation, optical magnetics, and transpond properties of semiconductor ferrimagnetic materials are presented. Preparation methods for various spinels are briefly mentioned with regard to obtaining temperature Curie points. Physical measurements on spinels include the resistivity, magnetoresistance, extraordinary Hall effect, magnetization, and magnetic susceptibility, all being measured particularly in the vicinity of the Curie temperature. For rare earth chalcogenides the conductivity, photoconductivity, magnetic dichroism, and optical properties related to f electron transitions were studied. Magnetic alloys, Sn Te-Mn Te, were considered with regard to resistivity, Hall effect, magnetoresistance, and critical diffusion. The Haas theory was extended to ferrimagnetic semiconductors. Theoretical contributions to the extraordinary Hall effect in terms of spin-orbit coupling for scattering computation are mentioned together with Mott transition mechanisms for the metal-insulator transition in doped EuO. ESRO

N74-22381 Laboratoire Central des Industries Electriques (France).
STUDY OF VORTEX DYNAMICS IN SUPER CONDUCTOR OF TYPE 2 Final Report [ETUDE DE LA DYNAMIQUE DES VORTEX DANS LES SUPRACONDUCTEURS DE TYPE 2]
J. Baixeras, G. Fournet, and T. Pech Mar. 1973 16 p refs In FRENCH
(Contract DGRST-69-01-990)
(Rept-449) Avail: Issuing Activity

Three methods for vortex dynamics studies are presented. The first uses the determination of resistive transition and magnetization curves, for samples of known metallurgical structure. The second determines the vortex network response to an e.m. wave thus yielding information in the vicinity of the critical field and bringing to light the importance of the relative orientation between the static magnetic field and the propagation vector of the e.m. wave. The third method directly detects the vortex motion by using a Josephson junction manufactured from the sample under study. Local vortex velocity is thus obtained but great technological difficulties have to be overcome, the details of which are given together with provisional solutions. ESRO

N74-22382*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONDUCTIVITY OF BOULES OF SINGLE CRYSTAL SODIUM BETA-ALUMINA
William L. Fielder, Harold E. Kautz, J. Stuart Fordyce, and Joseph Singer 1974 19 p refs Presented at Ann. Meeting of the Electrochem. Soc. San Francisco, 12-14 May 1974
(NASA-TM-X-71546; E-7955) Avail: NTIS HC $4.00 CSCL 20B

The ionic and electrochemical polarization characteristics of two boules of single crystal sodium beta-alumina ($Na_2O.8Al_2O_3$), 2 cm in diameter, were investigated over the range of 25 to 300 C using 2- and 4-probe ac and dc techniques with reversible and ion-blocking electrodes. Textural (or internal) polarization at 27 C was present only in boule 1 which cleaved easily. Interfacial polarization, using solid sodium electrodes, was present at 27 C in the 2-probe conductivities for both boules. Cleaning with liquid sodium at 300 C reduced its magnitude, but some interfacial polarization was still present in the 2-probe conductivities for boule 2 below about 140 C. Above 140 C, with liquid sodium electrodes, the 2-probe conductivities, essentially polarization-free, were given by $KT = 3300 \exp(-3650/RT)$. The conductivity of boule 2 at 180 C remained essentially constant with increasing current density up to about 140 milliamps per square centimeter. Author

N74-22383*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOLID STATE POLYMERIZATION AND CRYSTALLOGRAPHY OF POLYIMIDE PRECURSORS Ph.D. Thesis - Va. Univ.
Noel Thomas Wakelyn May 1974 160 p refs
(NASA-TM-X-70044) Avail: NTIS HC $11.00 CSCL 20B

Although the production of crystallinity in a polymeric system has historically led to commerically useful properties, the polyimides, prized for their high temperature characteristics, as customarily synthesized by melt or solution casting, are amorphous. It is shown that polymide containing residual crystallinity can be synthesized by isothermal annealing of crystals of the salt of the diisopropyl ester of pyromellitic acid and phenylene diamine. The reaction is topochemical in that the geometry of the polymer product is dependent upon that of the crystalline precursor. Infrared spectroscopy reveals the presence of imide absorption in the polymer, while powder diffractometry suggests residual crystallinity. Single crystal X-ray analysis of the monomer yields a structure of chains of alternating acid and base suggesting that the monomer is amenable to polymerization with a minimum of geometrical disruption. Author

N74-22384# National Bureau of Standards, Washington, D.C.
PROPERTIES OF SELECTED SUPERCONDUCTIVE MATERIALS: SUPPLEMENT, 1974
B. W. Roberts Apr. 1974 88 p refs Prepared by G.E. Schenectady, N. Y.
(Contract NBS-3-35717)
(NBS-TN-825) Avail: SOD HC $1.25 as C13.46:825

Data include additional superconductive materials extracted from a portion of the world literature up to mid-1973. The data presented are new values and have not been selected or compared to values previously assembled by the superconductive materials data center. The properties included are composition, critical temperature, critical magnetic field, crystal structure and the results of negative experiments. Special tabulations of high magnetic field materials with Type II behavior and materials with organic components are included. All entries are keyed to the literature and a list of reviews centered on superconductive materials is included. Author

N74-22385# California Univ., Berkeley. Lawrence Berkeley Lab.
ELECTRONIC STRUCTURE OF DIAMOND, ZINCBLENDE, AND CHALCOPYRITE SEMICONDUCTORS Ph.D. Thesis
C. V. deAlvarez 1973 147 p refs
(Contract W-7405-eng-48)
(LBL-1863) Avail: NTIS HC $9.50

The dependence of energy band structure and electronic charge density on pseudopotential parameters is investigated for: InSb, InAs, InP, GaP, Si, ZnGeP2, and ZnGeAs2. NSA

N74-22386# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.
EXPRESS INSTRUMENTAL DETERMINATION OF GERMANIUM AND HALOIDS BY ACTIVATION METHOD USING NEUTRON GENERATOR AND GAMMA-SPECTROMETRY WITH SEMICONDUCTOR Ge(Li) DETECTOR
I. Duda 1973 24 p refs In RUSSIAN; ENGLISH summary
(JINR-P12-7446) Avail: AEC Depository Libraries HC $3.25

Germanium and halogens were determined over the analytical photopeaks of isomers and isotopes Ge-75m, Cl-34m, O-19, I-126, and Br-78 produced in the reactions (n,2n) or (n,p) when irradiated with fast 14-MeV neutrons. Use of Ge(Li) detector (v = 40 cubic cm3) of high resolution and efficiency made it possible to determine simultaneously several elements in one sample of the substance under analysis. The detection limits for the present conditions are from 0.0023g (iodine) to 0.00018g (germanium). The method is suitable for express determination of the mentioned elements as microcomponents in the samples of 0.1 to-0.2 g. The determination duration is about 15 min. Author (NSA)

N74-22387# Siemens-Schuckertwerke A.G., Erlangen (West Germany).
SYSTEM REPRESENTATION OF THE ELECTRODYNAMIC SUSPENSION PRINCIPLE [SYSTEMDARSTELLUNG DES ELEKTRODYNAMISCHEN SCHWEBEPRINZIPS]
E. Kill 1973 15 p In GERMAN Presented at the DGLR Symp. Moeglichkeiten eines Spurgebundenen Hochgeschwindigkeitsverkehrs, Bonn, 6 Nov. 1973
(DGLR-Paper-73-155) Avail: NTIS HC $4.00

The principles of electrodynamic suspension technology with superconducting magnets, are discussed, and the application

to rail transportation is surveyed. For the velocity range between 300 and 500 km/h magnetic cushion vehicles with superconducting magnets using the principle of repulsion, and with linear motors, are proposed. The suspension heights are between 10 and 30 cm. Some experimental vehicles are discussed. ESRO

N74-22388# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France).
IRRADIATION DESTRUCTION OF M CENTERS IN THE MAGNESIUM FLUORIDE [DESTRUCTION, PAR IRRADIATION, DES CENTRES M DANS LE MgF2]
G. Panabiere, M. Romero, and M. Soulet Jan. 1974 42 p refs In FRENCH
(ONERA-DERTS-NT-02-34) Avail: NTIS HC $5.25

The Farge model of the Degradation kinetics of alkaline halides under an electron irradiation, illustrating the secondary process of recombination of interstitials either with F centers or with saturable or unsaturable vacancies, is applied to magnesium fluoride. Three samples were irradiated using 1.34 MeV electrons with a 7.10 to the 10th power c(-)/sq cm/sec fluency flow. One of those samples was re-irradiated using 1.34 MeV electrons with the same fluency flow. Results on the disappearance kinetics of M centers vs the irradiation temperature, and vs the F center concentration are reported, and discussed. Results show that the secondary process of recombination of F center interstitials is similar for MgCl, LiF, and KCl. This phenomenon under the re-irradiation decreases the absorption bands corresponding to M centers, and is a function of the crystal F center concentration. ESRO

N74-22389# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
APPLICATION OF VAPOR PHASE DEPOSITS, USING SEPARATED FLUX COMPONENTS, TO THE DEVELOPMENT OF FERRIMAGNETIC MATERIALS Final Report [ETUDE D'APPLICATIONS DES DEPOTS EN PHASE VAPEUR AVEC APPORT DE COMPOSANTS EN FLUX SEPARES A LA REALISATION DE MATERIAUX FERRIMAGNETIQUES RAPPORT FINAL]
N. T. Linh Sep. 1972 24 p refs In FRENCH
(Contract DGRST-70-7-2570)
Avail: NTIS HC $4.25

A method for the preparation of YIG ferrimagnetic materials by vaporphase deposition is presented. The reaction thermochemistry for the yttrium chloride-iron chloride-water system was undertaken leading to the choice of oxygen as oxidizing agent of the chlorides. The chemical reactor design is detailed with regard to the need for a turbulent flow in the deposition zone for gas homogenization purposes and the possibility of working with more than two separated flux components. The feasibility of garnets was demonstrated and homogeneous epitaxial layers of YIG on GGG and YAG stubstrates obtained up to 1.5 sq cm of surface. The necessary substrate preparation by etching and polishing was developed and is discussed. ESRO

N74-22390# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
LIQUID PHASE EPITAXIAL PREPARATION OF HIGH PURITY PbSnSe ALLOYS FOR THEIR APPLICATION TO THE INFRARED DETECTION Final Report [PREPARATION D'ALLIAGES PbSnSe DE TRES HAUTE PURETE PAR EPITAXIE EN PHASE LIQUIDE POUR UTILISATION EN DETECTION INFRAROUGE RAPPORT FINAL]
Faure Oct. 1972 43 p In FRENCH
(Contract DGRST-70-7-2572)
Avail: NTIS HC $5.25

Possible methods for liquids epitaxy of a selected ternary system for high purity, single crystal, IR emissive material is presented. The stoichiometry control is essential and the phase diagram was determined. Three methods for epitaxy are discussed. A dipping method with low interface gradient and low thermal velocity is described. A vertical drawer instrument was built, also yielding a strong temperature gradient above the bath. A so-called rotating device was tested with which immersion or extraction of the substrate is performed by rotation. Best results were obtained with the drawer method. The growth domain extends between 700 and 850 C. The Sn segregation coefficient was shown to be not very different from a Bridgmann type monocrystallization. The fabrication of photovoltaic detectors at 10 microns is possible but the defined junctions exhibit low detectivity. No expitaxial junctions can be obtained during the growth process by stoichiometry variation. ESRO

N74-22391# California Univ., Los Angeles. Dept. of Physics.
ELECTRON SPIN RESONANCE IN SUPERCONDUCTORS
R. Orbach Feb. 1974 10 p refs Prepared in cooperation with Tel-Aviv Univ.
(Contract N00014-69-A-0200-4032)
(AD-774671; TAUP-413-73) Avail: NTIS CSCL 20/12

The internal field distribution in type 2 superconductors substantially alters the electron spin resonance g value and line shape. The resulting changes can be used to determine both the width and approximate shape of the internal field distribution. Author (GRA)

N74-22392# Office of Naval Research, London (England).
MAGNETIC BUBBLES MEETING
Arthur H. Waynick 19 Nov. 1973 37 p Conf. held at London, 5-7 Sep. 1973
(AD-775396; ONRL-C-21-73) Avail: NTIS CSCL 20/12

This is a report on a specialist conference on magnetic bubble technology. The material dealt with covers the device requirements of materials substrates and epilayers; growth techniques - liquid plane epitaxy (LPE), chemical vapor deposition (CVD), and hydrothermal (also including amorphous films); physical characterization and technology. Author (GRA)

N74-22393# Radio Corp. of America, Princeton, N.J.
ALUMINUM-OXIDE PASSIVATION OF ELECTRON-BEAM-SEMICONDUCTOR SILICON AND GALLIUM-ARSENIDE DIODES Final Report, 1 Aug. 1972 - 30 Nov. 1973
Wieslaw W. Siekanowicz, Ho. C. Huang, Dorothy Hoffman, Stewart Jolly, and Yuen C. Chiang Feb. 1974 35 p refs
(Contract N00014-73-C-0020)
(AD-775549; PRRL-74-CR-06) Avail: NTIS CSCL 09/5

Beam-evaporated aluminum oxide constitutes a highly promising material for passivation of electron-beam-semiconductor targets. Aluminum-oxide-passivated targets are characterized by reverse breakdown voltages that range from 80% to essentially the full breakdown value and reverse leakage currents that are less than one microampere. A life of 2600 hours was demonstrated on an aluminum-oxide-passivated silicon pn-junction at a current gain of 2200, a beam voltage of 12 kV, and power and current densities of 42 W and 0.82 A/sq. mm, respectively. A life of 770 hours has been accumulated on a gallium-arsenide Schottky-barrier diode at a current gain of 2000, a beam voltage of 12.8 kV, power and current densities of 20 W and 0.48 A/sq. mm, respectively. The active diameter of each target was 0.012 inch. Author (GRA)

N74-22394# Science Applications, Inc., Arlington, Va.
MONTE CARLO CALCULATIONS OF DOSE DISTRIBUTION IN SEM IRRADIATED SEMICONDUCTOR STRUCTURES Final Report, 18 May - 18 Oct. 1973
William L. Chadsey 18 Oct. 1973 28 p refs
(Contract N00164-73-C-0517; DNA Proj. NWER-TD-043)
(AD-775319; SAI-73-567-AR; NAD-CR-TR/7024/C74/64)
Avail: NTIS CSCL 20/12

Monte Carlo calculations were performed to determine the two-dimensional dose distribution in a metal/oxide/silicon substrate structure irradiated by the electron beam from a scanning electron microscope (SEM). The objective was to investigate energy deposition in transistors neighboring an MOS capacitor test pattern irradiated by a SEM electron beam. The principal conclusion is that no damage to neighboring transistors is predicted - the dose in the oxide layer 2 microns from the boundary of the test pattern is four orders of magnitude smaller than the soe dose in the test pattern oxide for a 20 keV beam. Plots and tables of depth dose distribution, radial dose distribution, dose distribution near a rectangular target pattern, charge deposition distribution, and radial distribution of reflected charge are presented. Author (GRA)

N74-22395# Colorado State Univ., Fort Collins. Dept. of Physics.
QUANTUM SIZE EFFECTS IN SEMIMETALS AND SEMI-

CONDUCTORS Annual Summary Report, 1 Feb. 1973 - 31 Jan. 1974
James R. Sites and Carl W. Wilmsen 31 Jan. 1974 11 p
(Contract N00014-67-A-0299-0017; NR Proj. 372-305)
(AD-774914; SF-1) Avail: NTIS CSCL 20/12

The basic facilities for the thin film compound semiconductor program have been developed. Results were obtained in the areas of transport properties of bismuth and indium antimonide films, the theory of quantum size effects, insulating barriers with In Sb devices, and optical constants of In Sb films.

Author (GRA)

N74-22396# Boeing Co., Seattle, Wash.
THE STRUCTURE OF NON-CRYSTALLINE MATERIALS Final Report, 4 Feb. 1971 - 31 Dec. 1973
Farrel W. Lytle 31 Dec. 1973 62 p refs
(Contract DAHC04-71-C-0010; ARPA Order 1562)
(AD-774895) Avail: NTIS CSCL 20/2

The primary purpose of this research was to develop the phenomenon of extended x-ray absorption fine structure (EXAFS) as a technique for investigating the structure of non-crystalline materials, particularly amorphous semiconductors. The EXAFS work on amorphous semiconductors was continued on GeSe, GeSe2, As2Se3, As2S3, and As2Te3. Accompanying this final report are three papers describing the EXAFS experimental and data analysis techniques.

GRA

N74-22397# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
NEW METHODS FOR GROWTH AND CHARACTERIZATION OF GaAs AND MIXED 3-V SEMICONDUCTOR CRYSTALS Final Technical Report, 1 Jul. 1970 - 30 Jun. 1973
William R. Wilcox, Worth P. Allred, Clarence R. Crowell, Agerico Esquivel, and Murray Gershenzon 30 Jun. 1973 344 p refs
(Grants DAHC15-70-G-0014; DAHC15-71-G-0006; DAHC15-72-0007; APRA Order 1628)
(AD-774967; USCEE-460) Avail: NTIS CSCL 20/12

The purpose of this program was to develop new and improved methods for the growth and characterization of gallium arsenide (GaAs) and mixed III-V semiconductor crystals. This was accomplished by laboratory experiments and related theoretical research. New Czochralski, floating zone melting, gradient freeze, and liquid epitaxy techniques for GaAs growth were developed and studied. The travelling heater method for GaAs and III-V alloys was studied. Material was characterized by spark-source mass spectrometry, ion microprobe mass analyzer, glow-discharge spectroscopy, infrared absorption, dislocation etching, X-ray topography, cathodoluminescence, photoluminescence, Hall measurements, photothreshold, and C-V-W measurements on Schottky barriers. Dislocations generated by bending were observed by cathodoluminescence and the effect on electrical properties determined. A new technique for measuring and controlling oxygen in gallium melts was developed and studied.

Author (GRA)

N74-22398# Ford Motor Co., Dearborn, Mich.
ABSORPTION LOSSES IN EPITAXIAL PbTe FILMS FOR POTENTIAL INTEGRATED OPTICS APPLICATION Final Technical Report, 1 Oct. - 31 Dec. 1973
W. H. Weber, S. L. McCarthy, and M. Mikkor Feb. 1974 55 p refs
(Contract N00014-73-C-0289; ARPA Order 2327)
(AD-775000) Avail: NTIS CSCL 09/1

Optical absorption measurements at 300K and 77K in the 2.5-12 micrometer range are presented for epitaxial PbTe films grown on BaF2 substrates. Effects due to carrier concentrations, growth conditions, and possible impurities are discussed. In high carrier concentration films (p > or = 10 to the 18th power/cc) the absorption is free-carrier limited, while in low p material the absorption appears to be impurity limited. The impurity limited absorption, which shows wide variations between samples, correlates with the observation of Cl in the ion back-scattering spectra. The lowest observed 10 micrometer loss is 16/cm. A threshold analysis on PbTe diode lasers made with annealed samples indicates the threshold gain is 10-20/cm, about a factor of 10 below that obtained in similar laser in unannealed films.

Author (GRA)

N74-22399# Harry Diamond Labs., Washington, D.C.
GRUNEISEN DATA FROM THE FREE SURFACE VELOCITY OF THERMOELASTIC MATERIALS
R. B. Oswald, F. B. McLean, D. R. Schallhorn, and T. R. Oldham May 1973 36 p refs
(DA Proj. 1B0-62113-A-661; HDL Proj. 25227)
(AD-775423; HDL-TR-1629) Avail: NTIS CSCL 20/12

A technique is presented for the measurement of the Gruneisen parameter of a solid from the free surface velocity induced by pulsed energy deposition. The technique is used to obtain both temperature-dependent and temperature-independent Gruneisen data. The measurements employ a velocity interferometer to determine the free surface velocity of solids exposed to a pulsed electron beam. Results are presented for Al, Cu, Ge and Si in a temperature range where the Gruneisen parameter is constant. In all cases the results are in excellent agreement with the thermodynamic values. (Modified author abstract) GRA

N74-22400# Connecticut Univ., Storrs. Dept. of Physics.
RADIATION DAMAGE IN SOLIDS AND PHONON SCATTERING Final Report, 1 Jul. 1970 - 30 Sep. 1973
Paul G. Klemens 31 Oct. 1973 17 p refs
(Grants DA-ARO(D)-31-124-70-G98; DA-ARO(D)-31-124-71-G139)
(AD-775516; AROD-9190-10-P) Avail: NTIS CSCL 20/12

The report describes experimental and theoretical work on the use of phonon scattering techniques to study defects in solids. Low temperature thermal conductivity measurements were made on tin, tin-cadmium, sapphire, tourmaline and fluoroapatite in the range 4 to 77K. Work is described on improved techniques of generating surface waves and of measuring surface wave attenuation. Waves were generated using wedges and interdigital transducers on removable plaques. Attenuation changes were measured using insertion loss changes, and absolute values of attenuation were obtained by probing the beam using optical diffraction. Measurements were made on surfaces with bonded powder, and on quartz surfaces subject to particle irradiation. In the latter case the effect of irradiation was too small to be measured. Theoretical studies include radiative heat transport in solid composites and thermoelectric power of metals.

Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-22401*# Rocketdyne, Canoga Park, Calif.
SPACE SHUTTLE APS PROPELLANT THERMAL CONDITIONER STUDY Final Report
D. L. Fulton May 1973 418 p refs
(Contract NAS9-12046)
(NASA-CR-134242; R-9167) Avail: NTIS HC $24.00 CSCL 21I

An analytical and experimental effort was completed to evaluate a baffle type thermal conditioner for superheating O2 and H2 at supercritical pressures. The thermal conditioner consisted of a heat exchanger and an integral reactor (gas generator) operating on O2/H2 propellants. Primary emphasis was placed on the hydrogen conditioner with some effort on the oxygen conditioner and a study completed of alternate concepts for use in conditioning oxygen. A hydrogen conditioner was hot fire tested under a range of conditions to establish ignition, heat exchange and response parameters. A parallel technology task was completed to further evaluate the integral reactor and heat exchanger with the side mounted electrical spark igniter.

Author

N74-22402# European Space Research Organization, Paris (France).
TECHNICAL PERFORMANCE OF SIMPLE AND COMPLEX LITHIUM COMPOUNDS IN LITHERGOLIC SYSTEMS. PART 1: SIMPLE LITHIUM COMPOUNDS

H. Weiler (DFVLR, Lampoldshausen, West Ger.) Mar. 1974 65 p refs Transl. into ENGLISH of Theoretische Leistungen Einfacher und Komplexer Lithiumverbindungen in Lithergolen Systemem. Teil 1: Einfache Lithiumverbindungen, DLR-FB-73-23, DFVLR, 15 Dec. 1972
(ESRO-TT-32-Pt-1; DLR-FB-73-23-Pt-1) Avail: NTIS HC $6.25; Original report in GERMAN: DFVLR, Porz, West Ger. 21 DM

Theoretical values of specific impulse and other performance parameters in equal conditions were calculated and plotted for certain interesting solid lithium fuels in combination with various oxidizers at a chamber pressure of 9.81 bar for various expansions ratios. The fuels considered were lithium, lithium hydride, lithium amide, and lithium nitride, while the oxidizers were fluorine, chlorotrifluoride, chloropentafluoride, and tetrafluorohydrazine. The influence of the propellant densities is presented. Approximate functions are described to calculate the performance values for various expansion ratios. Author (ESRO)

N74-22403# Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT AND EVALUATION OF PG/SiC CODEPOSITED COATINGS FOR ROCKET NOZZLE INSERTS. VOLUME 1: INSERT TEST AND EVALUATION IN HIGH PERFORMANCE PROPELLANT ENVIRONMENTS Final Report, Apr. 1972 - Aug. 1973
Cedric Bielawski, Kenneth E. Undercoffer, and Richard H. Singleton Feb. 1974 141 p refs
(Contract F04611-72-C-0047; AF Proj. 3148)
(AD-775346; AFRPL-TR-73-107-Vol-1; Rept-46-5544-1-2/4; Rept-46-5544-2-1/2) Avail: NTIS CSCL 21/9

Seven 1.7-inch throat diameter rocket nozzles were test fired in the HIPPO high pressure facilities at Edwards Air Force Base using three different solid propellants. Three 1.0-inch and two 2.0-inch throat diameter rocket nozzles were test fired at Atlantic Research Corporation using three different gel propellants. All of the throat inserts and most of the entrance sections were coated with PG/SiC. The erosion rates of all of the coated inserts tested in this program are plotted in Figures 49 and 50 as functions of pressure with temperature and level of gas oxidizing species indicated. No delaminations occurred. Some cracking of the inserts occurred but this did not interfere with the attainment of erosion data. (Modified author abstract) GRA

N74-22404# Naval Postgraduate School, Monterey, Calif.
APPLICATION OF LASER SCHLIEREN AND MONOCHROMATIC PHOTOGRAPHY TO SOLID PROPELLANT COMBUSTION RESEARCH M.S. Thesis
Owen Allen Klahr Dec. 1973 38 p refs
(AD-775026) Avail: NTIS CSCL 21/9

Ammonium perchlorate (AP) -binder sandwiches and a composite propellant were burned in a combustion bomb at various pressures. A schlieren system equipped with an argon laser was used to study the flame structure. High speed monochromatic motion pictures of solid propellant were taken during combustion, and ammonium perchlorate-binder interactions were investigated. The monochromatic pictures demonstrated that propellants without opacifiers cannot be effectively examined for surface interactions during combustion when using high intensity laser light. (Modified author abstract) GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-22405*# Garrett Corp., Los Angeles, Calif.
HIGH-TIP-SPEED, LOW-LOADING TRANSONIC FAN STAGE. PART 2: DATA COMPILATION
T. C. Ware, R. J. Kobayashi, and R. J. Jackson Feb. 1974 319 p ref
(Contract NAS3-13498)
(NASA-CR-121262; AiResearch-73-9487-Pt-2) Avail: NTIS HC $19.00 CSCL 21E

Tests were conducted on a high-tip-speed low-loading transonic fan stage to determine the performance and inlet flow distortion tolerance of the design. Test data were recorded for overall and blade element performance with both uniform and distorted inlet flows. A tabular summary of the data and a representative selection of the computer data reduction sheets are presented. Details of the tests are reported in NASA CR-121263, High-Tip-Speed, Low-Loading Transonic Fan Stage (Part 3 - Final Report), dated February 1974. Author

N74-22406*# Garrett Corp., Los Angeles, Calif.
HIGH-TIP-SPEED, LOW-LOADING TRANSONIC FAN STAGE. PART 3: FINAL REPORT
T. C. Ware, R. J. Kobayashi, and R. J. Jackson Feb. 1974 202 p refs
(Contract NAS3-13498)
(NASA-CR-121263; AiResearch-73-9488-Pt-3) Avail: NTIS HC $13.25 CSCL 21E

Tests were conducted on a high-tip-speed, low-loading transonic fan stage to determine the performance and inlet flow distortion tolerance of the design. The fan was designed for high efficiency at a moderate pressure ratio by designing the hub section to operate at minimum loss when the tip operates with an oblique shock. The design objective was an efficiency of 86 percent at a pressure ratio of 1j5, a specific flow (flow per unit annulus area) of 42 lb/sec-ft squared (205.1 kgm/sec-meters squared 2), and a tip speed of 1600 ft/sec (488.6 m/sec). During testing, a peak efficiency of 84 percent was achieved at design speed and design specific flow. At the design speed and pressure ratio, the flow was 4 percent greater than design, efficiency was 81 percent, and a stall margin of 24 percent was obtained. The stall line was improved with hub radial distortion but was reduced when the stage was tested with tip radial and circumferential flow distortions. Blade-to-blade values of static pressures were measured over the rotor blade tips. Author

N74-22407# California Inst. of Tech., Pasadena. Environmental Quality Lab.
ANALYSIS OF AN EVAPORATIVE CONTROLS RETROFIT PROGRAM FOR THE SOUTH COAST AIR BASIN
Kenneth Heitner and Randall G. Williams May 1973 39 p refs
(Grant NSF GI-29726)
(EQL-Memo-3) Avail: NTIS HC $5.00

The pre-1970 vehicle population of the South Coast Air Basin of California is analyzed back to 1962 to find which makes and models will continue to constitute a major fraction of the vehicle population over the next few years. These are the vehicles that it will be most practical to retrofit, since a retrofit kit can cover a large number of vehicles. On the basis of this population analysis, series of case studies were made illustrating how the new vehicle control technology can be adopted to the retrofit situation. The cost of the materials and labor are estimated in detail, in order to obtain a realistic idea of typical retrofit costs. The possibility of a partial retrofit of controls covering either the carburetor or the fuel tank is also discussed. Author

N74-22408*# General Electric Co., Evendale, Ohio. Aircraft Engine Group.
NASA/GE QUIET ENGINE C ACOUSTIC TEST RESULTS
S. B. Kazin and J. E. Pass Apr. 1974 215 p refs
(Contract NAS3-12430)
(NASA-CR-121176; R73AEG364) Avail: NTIS HC $13.75 CSCL 21E

The acoustic investigation and evaluation of the C propulsion turbofan engine are discussed. The engine was built as a part of the Quiet Engine Program. The objectives of the program are as follows: (1) to determine the noise levels produced turbofan bypass engines, (2) to demonstrate the technology and innovations which will reduce the production and radiation of noise in turbofan engines, and (3) to acquire experimental acoustic and aerodynamic data for high bypass turbofan engines to provide a better understanding of noise production mechanisms. The goals of the program called for a turbofan engine 15 to 20 PNdB quieter than currently available engines in the same thrust class.
Author

N74-22409*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BASIC PERFORMANCE OF A MULTILAYER INSULATION SYSTEM CONTAINING 20 TO 160 LAYERS
Robert J. Stochl Washington Apr. 1974 28 p refs
(NASA-TN-D-7659; E-7815) Avail: NTIS HC $3.25 CSCL 20M

An experimental investigation was conducted to determine the thermal effectiveness of an aluminized Mylar-silk net insulation system containing up to 160 layers. The experimentally measured heat flux was compared with results predicted by using (1) a previously developed semi-empirical equation and (2) an effective-thermal-conductivity value. All tests were conducted at a nominal hot-boundary temperature of 294 K (530 R) with liquid hydrogen as the heat sink. The experimental results show that the insulation performed as expected and that both the semi-empirical equation and effective thermal conductivity of a small number of layers were adequate in predicting the thermal performance of a large number of layers of insulation. Author

N74-22410# Joint Publications Research Service, Arlington, Va.
LOW-THRUST ENGINES FOR INTERPLANETARY FLIGHTS
M. Lisun and V. Preobrazhenskiy 17 Apr. 1974 9 p Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 2, Feb. 1974 p 38-39
(JPRS-61767) Avail: NTIS HC $4.00

A family of engines with low thrust for interplanetary travel is described. The types of propulsion considered are: (1) thermonuclear, (2) electric rocket, (3) radioisotope, (4) quantum, (5) electrothermal, (6) electromagnetic, (7) photon, (8) solar sail, and (9) laser sail. Diagrams of the various types of engines are provided. The expected performance parameters are defined. Author

N74-22411*# Kanner (Leo) Associates, Redwood City, Calif.
DEVELOPMENT OF RUSSIAN ROCKET ENGINE TECHNOLOGY
Ye. K. Moshkin Washington NASA Mar. 1974 208 p refs Transl. into ENGLISH of the book "Razvitiye Otechestvennogo Raketnogo Dvigatelestroyeniya" Moscow, Mashinostroyeniye Press, 1973 256 p
(Contract NASw-2481)
(NASA-TT-F-15408) Avail: NTIS HC $13.50 CSCL 21H

The history is presented of the creation of Soviet liquid-fueled rocket engines. The works of K. E. Tsiolkovskiy and Yu. V. Kondratyuk on the selection of engine and rocket designs, including multistage designs, are described. The properties of fuel components for liquid-fueled engines and the work of F. A. Tsander in the area of the creation of original plans for spacecraft and rocket engines are studied. The use of elements of the structure of the rockets as additional fuel is analyzed; the creative path of a number of leading Soviet scientists is traced. The activity of the first Socket rocket organizations is discussed and the liquid-fueled rocket engines and aircraft rocket engines which they created are analyzed. Some modern, high-power liquid-fueled rocket engines are described. Author

N74-22412*# Hamilton Standard, Windsor Locks, Conn.
FREQUENCY OF SUPERSONIC INLET UNSTARTS DUE TO ATMOSPHERIC TURBULENCE Final Report
Frank W. Barry Oct. 1973 191 p refs
(Contract NAS2-4515)
(NASA-CR-137482; HSER-5838) Avail: NTIS HC $12.75 CSCL 21E

A method is developed for relating propulsion system performance penalties due to transient tolerances in inlet throat Mach number and in normal position to the statistical frequency of unstarts of a supersonic inlet caused by atmospheric disturbances. Data on high-altitude atmospheric turbulence, including power spectra and cross spectra of the three gust components and ambient temperature changes and probability of encountering turbulence, are collected and evaluated. General linear analytical models are developed to compute changes in inlet throat Mach number and in normal shock position due to disturbances in inlet geometry, upstream and exit (bypass and engine) flow conditions. The relation of inlet transient tolerances to propulsion system performance is established. A stepwise procedure for relating frequency of inlet unstarts to transient tolerances is presented and applied to representative examples to demonstrate that significant penalties in range may be associated with a low frequency of inlet unstarts. Author

N74-22413*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYDES: A GENERALIZED HYBRID COMPUTER PROGRAM FOR STUDYING TURBOJET OR TURBOFAN ENGINE DYNAMICS
John R. Szuch Washington Apr. 1974 135 p refs
(NASA-TM-X-3014; E-7316) Avail: NTIS HC $4.75 CSCL 21E

This report describes HYDES, a hybrid computer program capable of simulating one-spool turbojet, two-spool turbojet, or two-spool turbofan engine dynamics. HYDES is also capable of simulating two- or three-stream turbofans with or without mixing of the exhaust streams. The program is intended to reduce the time required for implementing dynamic engine simulations. HYDES was developed for running on the Lewis Research Center's Electronic Associates (EAI) 690 Hybrid Computing System and satisfies the 16384-word core-size and hybrid-interface limits of that machine. The program could be modified for running on other computing systems. The use of HYDES to simulate a single-spool turbojet and a two-spool, two-stream turbofan engine is demonstrated. The form of the required input data is shown and samples of output listings (teletype) and transient plots (x-y plotter) are provided. HYDES is shown to be capable of performing both steady-state design and off-design analyses and transient analyses. Author

N74-22414*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INTERFERENCE BETWEEN EXHAUST SYSTEM AND AFTERBODY OF TWIN-ENGINE FUSELAGE CONFIGURATIONS
Jack F. Runckel Washington May 1974 44 p refs
(NASA-TN-D-7525; L-9283) Avail: NTIS HC $3.25 CSCL 01B

Some of the mutual aircraft afterbody and engine nozzle interferences that can exist on aircraft complex aft-ends and on simplified twin-jet afterbodies are reviewed. Emphasis is placed on studies of twin-engine fuselage configurations with nozzles installed near the terminus of the afterbody where the interactions of the nozzle exhausts and external stream produce a complex flow-field environment. The magnitude of the aft-end problem for real aircraft configurations is illustrated, and some theoretical and empirical considerations of afterbody drag on simple bodies are treated. Many of the factors regarding airframe-installation effects on nozzle performance are discussed, as well as nozzle-installation effects on aircraft performance. Author

N74-22415*# Rocketdyne, Canoga Park, Calif.
TANK 12 DATA DUMP OME INTEGRATED THRUST CHAMBER TEST REPORT, PHASE 1 Space Shuttle Orbit Maneuvering Engine Reusable Thrust Chamber Program
R. P. Pauckert and R. D. Tobin 9 Apr. 1974 190 p
(Contract NAS9-12802)
(NASA-CR-134256; ASR74-117) Avail: NTIS HC $12.50 CSCL 21H

The test program conducted to characterize the steady state stability, thermal, and performance characteristics of the integrated thrust chamber assembly, as well as limited tests to investigate transient characteristics are described. Author

N74-22416*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INVESTIGATION OF NOISE FROM FULL-SCALE HIGH BYPASS ENGINE AND BLOWN FLAP SYSTEM
W. L. Jones and L. J. Heidelberg 1974 31 p refs Presented at Air Transport Meeting, Dallas, 30 Apr. - 2 May 1974; sponsored by SAE
(NASA-TM-X-71539; E-7946) Avail: NTIS HC $4.75 CSCL 21E

A summary is presented of an acoustic test program for investigating engine noise suppression and jet/flap interaction noise associated with an EBF STOL powered lift system. A highly suppressed TF-34 engine and EBF wing were used in the

investigation. The engine was suppressed 21 PndB to a level of 94 PndB. An UTW powered lift system was tested with conventional, mixer, and decayer-type nozzles. The configuration with velocity decayer nozzle and acoustically treated shroud had the lowest noise (98 PndB). An OTW configuration with non-decayer nozzle was about 10 db quieter than the corresponding UTW system. UTW and OTW noise data are compared with scale model correlations. Author

N74-22417# United Aircraft Corp., East Hartford, Conn. Research Labs.
DEVELOPMENT OF OPTIMAL CONTROL MODES FOR ADVANCED TECHNOLOGY PROPULSION SYSTEMS Annual Technical Report, 1 Feb. 1973 - 31 Jan. 1974
Gerald J. Michael and Florence A. Farrar Mar. 1974 63 p
(Contract N00014-73-C-0281; NR Proj. 215-219)
(AD-775337; UARL-N911620-2) Avail: NTIS CSCL 21/5

A nonlinear multivariable feedback controller was defined for the idle to military operating regime (9 to 100 percent thrust) of the Pratt and Whitney Aircraft F401 variable cycle turbofan engine. The analytical design involved linearizing the F401 engine dynamics about five steady-state operating points between idle and military thrust, applying linear optimal control synthesis methods at each point, and combining the five optimal linear controllers into a single nonlinear controller which has feedback gains that are scheduled with high compressor speed. Variable fan, compressor and exhaust geometries as well as main burner fuel flow are coordinated by the controller to achieve rapid engine dynamic response. (Modified author abstract) GRA

N74-22418# Aerojet Solid Propulsion Co., Sacramento, Calif.
THE SELECTION AND DEMONSTRATION OF ADVANCED NONDESTRUCTIVE TESTING TECHNIQUES FOR ON-SITE MISSILE INSPECTION. VOLUME 1: TECHNICAL REPORT Final Report, 15 May 1972 - 14 Sep. 1973
H. P. Briar, K. W. Bills, Jr., R. W. Cribbs, and B. L. Lamb Nov. 1973 174 p refs Prepared in cooperation with Electra-Physics Co., Folsom, Calif.
(Contract F04611-72-C-0071)
(AD-774904; ASPC-1963-26F-Vol-1; AFRPL-TR-73-91-Vol-1) Avail: NTIS CSCL 21/9

The program was planned around the problem of on-site non-destructive testing (NDT) of solid rocket motors. It was designed to select, evaluate, and demonstrate NDT capabilities, beginning with comprehensive surveys of industry and the world's literature (from 1960 to mid-1972). Many materials and NDT devices were identified; most of these being ruled out by the constraints of in-silo testing. Only two techniques showed promise: ultrasonic holography and gamma radiography. (Modified author abstract) GRA

N74-22419# Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT AND EVALUATION OF PG/SIC CODEPOSITED COATINGS FOR ROCKET NOZZLE INSERTS. VOLUME 2: THERMOSTRUCTURAL ANALYSES OF SELECTED NOZZLE TEST FIRINGS Final Report, Apr.1972-Apr. 1973
James W. Murray, Jeffrey R. Vaughan, and Carl W. Anderson, Jr. Feb. 1974 386 p refs
(Contract F04611-72-C-0047; AF Proj. 3148)
(AD-775347; AFRPL-TR-73-107-Vol-2; Rept-46-5544-2-3/4) Avail: NTIS CSCL 21/9

Phase 2-Tasks 3 and 4 - Non-linear (elastic-plastic) thermostructural analyses were performed for seven PG/SiC codeposited inserts subjected to actual solid rocket test environments. A failure criteria for multiaxial stress fields and orthotropic material strengths was identified and used to predict failure of success of the inserts. A comparison of analytical predictions and actual test results in good correlation. Hence, a baseline was established from which a rational approach to designing codeposited inserts can be developed in the future. Author (GRA)

N74-22420# Naval Postgraduate School, Monterey, Calif.
EVALUATION OF THE FRACTURE POSTULATE FOR VISCOELASTIC MATERIALS M.S. Thesis
Robert Edwin Kapernick Dec. 1973 41 p refs
(AD-775041) Avail: NTIS CSCL 21/9

Experimental studies were conducted on unfilled viscoelastic materials such as a carboxy terminated polybutadiene to evaluate the fracture postulate which states that crack velocity is a unique function of stress intensity factor. To do this, fracture characterization tests were conducted for constant load, constant displacement, and constant displacement rate histories. A cyclic study, a more sophisticated application of the constant displacement rate case, was also conducted as a further evaluation of the fracture postulate. The analytical theory used in obtaining viscoelastic stress intensity factors was based upon linear theory and sharp crack geometries. Moderate correlation was obtained among all test cases, notwithstanding the presence of significant specimen strains and finite crack tip radii. Author (GRA)

N74-22421# Naval Postgraduate School, Monterey, Calif.
DYNAMIC AND FLUID DYNAMIC CHARACTERISTICS OF A FUEL INJECTION NOZZLE M.S. Thesis
Gordon McGlohon Nichols, Jr. Dec. 1973 84 p refs
(AD-775023) Avail: NTIS CSCL 21/7

Due to the increasing requirements for reduced emissions from internal combustion engines many manufacturers have expressed interest in gasoline fuel injection systems. In order to determine the fluid dynamic and dynamic characteristics of a commercial injector a test chamber was constructed and a laboratory simulation carried out. A proposed method of predicting flow rates and dynamic response has been compared with experimental results. Author (GRA)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-22422*# Stanford Univ., Calif. Inst. For Plasma Research.
A STUDY OF THE MEAN SOLAR MAGNETIC FIELD
Philip H. Scherrer Dec. 1973 158 p refs
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF GA-3113-8; NR Proj. 323-003)
(NASA-CR-138131; SU-IPR-554) Avail: NTIS HC$11.00 CSCL 03B

The magnetic field of the sun seen as a star was observed at the Mount Wilson Observatory. The sun-as-a-star field, or mean field, as measured in integrated sunlight was compared with both large scale averages of conventional solar magnetic maps and the interplanetary magnetic field observed near the earth. Three independent topics concerning the mean field observations and interpretation are discussed: (1) The relation between the mean field observations and models of large scale solar magnetic structure, (2) the nature of the comparison of the mean field with the interplanetary field, and (3) the relative contribution of fields on different parts of the solar disk to the mean field. Author

N74-22423*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROJECTS SOLRAD AND TIMATION: SPACE RADIATION EXPOSURE
E. G. Stassinopoulos 8 May 1974 73 p refs
(NASA-TM-X-70624; X-601-74-82) Avail: NTIS HC $6.75 CSCL 03B

The charged particle fluxes to be encountered by spacecraft in circular orbits with inclinations of 125 and 65 degrees, and altitudes of 13890 and 11111 kilometers, respectively were investigated. For these conditions, two nominal trajectories were generated corresponding to missions SOLRAD and TIMATION. The orbits and geomagnetic geometry, spectral profiles, peaks per orbit, trajectory data, and energetic solar proton fluxes are discussed. The tabulated results are analyzed. F.O.S.

N74-22424*# Texas Univ., Dallas.
[INVESTIGATIONS OF COSMIC RAY ANISOTROPIES AND THEIR RELATIONSHIP TO CONCURRENT MAGNETIC FIELD DATA] Final Technical Report
F. R. Allum Mar. 1974 45 p refs

(Grant NGR-44-004-133)
(NASA-CR-138127) Avail: NTIS HC $5.25 CSCL 03B

Investigations of cosmic ray anisotropies and their relationship to concurrent magnetic field data are reported. These investigations range in scope from the examination of data very late in the decay phase of a solar particle event where long term (approximately 6 hour) averages are used and definite interplanetary effects sought after to an examination of the change in low energy particle anisotropy as the satellite approaches the bow shock and the magnetopause. Author

N74-22425*# Scientific Translation Service, Santa Barbara, Calif.
COSMIC RAY STUDIES ABOARD ARTIFICIAL EARTH SATELLITES
N. L. Grigorov, ed., V. V. Akimov, V. Ye. Nesterov, I. D. Rapoport, L. F. Kalinkin, N. N. Volodichev, and I. N. Kiknadze Washington NASA May 1974 230 p refs Transl. into ENGLISH of the book "Izucheniye Kosmicheskikh Luchey na Iskusstvennykh Sputnikakh Zemli" Moscow, Nauka Press, 1973 172 p
(Contract NASw-2483)
(NASA-TT-F-15377) Avail: NTIS HC $14.50 CSCL 04A

Specific investigations in the field of cosmic ray physics are reported that were performed using artificial earth satellites. The major portion of the collection is made up of articles presenting the results of experiments made aboard the Proton 1, 2, 3 scientific space stations (measurements of hydrogen and carbon effective interaction sections, energy spectrum of primary cosmic ray particles of high and superhigh energies, study of the chemical composition of cosmic rays and high energy electron fluxes in near earth cosmic space). Methodological questions of cosmic ray study aboard artificial earth satellites are included. Author

N74-22426*# Texas Univ., Dallas.
SPECIFIC PROBLEMS IN COSMIC RAY RESEARCH SOLVABLE THROUGH USE OF PIONEERS 6-9 SPACECRAFTS Final Report
Ed. P. Keath May 1974 8 p refs
(Grant NGR-44-004-121)
(NASA-CR-138172) Avail: NTIS HC $4.00 CSCL 03B

A bibliography covering interplanetary cosmic ray flux measurements and the nature of both galactic and solar cosmic rays is presented. The data were taken by Pioneers 6 and 9. E.H.W.

N74-22427# Finnish Meteorological Inst., Helsinki.
CALCULATING LONGWAVE RADIATION TO THE EARTH'S SURFACE IN WINTER [MAAN PINNALLE TULEVAN PITKAEAALTOISEN SAETEILYN ARVIOIMISESTA TALVITILANTEISSA]
Erkki Laitinen 1973 18 p refs In FINNISH; ENGLISH summary
(Rept-45) Avail: NTIS HC $4.00

A method based on Danard (1969) for calculating longwave radiation to the earth's surface was applied to winter conditions in Sodankyla, Finland. Radiation observations in Sodankyla were used to determine the reliability of the calculation results. In clear weather, the calculated and observed results were very close; this indicates that the method can be used well for the prediction of temperature at least in a situation in which the weather clears up, the wind calms, and the temperature and moisture conditions remain unchanged, except in the atmospheric strata near the earth's surface. Under cloudy conditions, the observed and calculated results differed considerably from each other. Author

N74-22428*# California Inst. of Tech., Pasadena.
COSMIC RAY ISOTOPES
E. C. Stone 30 Nov. 1973 14 p refs Presented at the 13th Intern. Cosmic Ray Conf., Denver, 26 Aug. 1973
(Grant NGR-05-002-160)
(NASA-CR-138166; SRL-73-15) Avail: NTIS HC $4.00 CSCL 03B

The isotopic composition of cosmic rays is studied in order to develop the relationship between cosmic rays and stellar processes. Cross section and model calculations are reported on isotopes of H, He, Be, Al and Fe. Satellite instrument measuring techniques separate only the isotopes of the lighter elements. Author

N74-22429*# Maryland Univ., College Park.
SIMULATION OF COLLIDING SOLAR WIND STREAMS WITH MULTIFLUID CODES
K. Papadopoulos, R. W. Clark (NRL), and C. E. Wagner (NRL) Apr. 1974 14 p refs
(Grant NGL-21-007-005)
(NASA-CR-138174) Avail: NTIS HC $4.00 CSCL 03B

The description of a multifluid code with anomalous transport coefficients due to plasma instabilities self consistently followed in space and time is given. As an example, simulations of colliding solar wind streamers are presented. The results compare favorably with the observations. Author

N74-22430*# California Inst. of Tech., Pasadena. Div. of Physics, Mathematics, and Astronomy.
THE ENERGY SPECTRUM OF 0.16 TO 2 MeV ELECTRONS DURING SOLAR QUIET TIMES
G. J. Hurford, R. A. Mewaldt, E. C. Stone, and R. E. Vogt Feb. 1974 24 p refs
(Grant NGR-05-002-160)
(NASA-CR-138182; SRL-74-1) Avail: NTIS HC $4.25 CSCL 03B

New observations of the quiet-time energy spectrum of 0.16 to 2 MeV electrons were made with the Caltech Electron/Isotope Spectrometer which was launched on IMP-7 in September 1972. Earlier measurements of quiet-time electrons in this energy range by other groups have resulted in spectra differing by more than an order of magnitude in intensity. A minimum quiet-time flux somewhat lower than the lowest previously reported spectra and consistent with an extrapolation of the spectrum measured at higher energies was found. A galactic secondary source of knock-on electrons is consistent with the results and with independent studies of the interstellar spectra of cosmic ray nuclei provided that solar modulation does not suppress the 0.162 MeV electron flux by more than a factor of approximately 3. Although not required, other recently suggested sources may also contribute to the observed fluxes. Author

N74-22431# Lockheed Missiles and Space Co., Palo Alto, Calif.
DEVICE TO MEASURE THE FLUXES OF COSMIC RAY PROTONS AND NUCLEI WITH E GREATER THAN OR EQUAL TO 500 MeV PER NUCLEON ON THE PROGNOZ PROBES
V. A. Bliudov, N. N. Volodichev, N. L. Grigorov, Iu. N. Kuzin, O. B. Likin, O. Iu. Nechaev, A. N. Podorol'skii, I. A. Savenko, A. A. Suslov, and V. M. Ustinovshchikov 6 Mar. 1973 5 p refs Transl. into ENGLISH from Geomagn. Aeron. (USSR), v. 13, no. 6, 1973 p 1029-1032
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A scintillation Cerenkov counter mounted in the Prognoz, Prognoz-2, and Prognoz-3 to study the proton and nuclei fluxes of solar and galactic origin is described. Results of calibrating the device in flight are presented. Author

N74-22432# Atomic Energy of Canada Ltd., Chalk River (Ontario).
COSMIC RAY NM-64 NEUTRON MONITOR DATA FROM KULA, HAWAII AND MONTHLY GRAPHS, JAN. - DEC. 1972
J. F. Steljes Jul. 1973 43 p
(AECL-4599) Avail: AEC Depository Libraries HC $4.25; Atomic Energy of Can., Ltd., Chalk River $1.50

Uncorrected and barometer-corrected hourly data from a 3-NM-64 mobile latitude survey neutron monitor stationed at Kula, Maui, Hawaii, are given in tabular form for the period from January 1972 to December 1972. Graphs of the corrected data are given. Author (NSA)

N74-22433# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.
IDENTIFICATION OF THE TRACKS OF HEAVY NUCLEI OF THE PRIMARY COSMIC RADIATION IN MINERALS FROM METEORITES

O. Otgonsuren and V. P. Perelygin 1973 24 p refs In RUSSIAN
(JINR-P7-7406) Avail: AEC Depository Libraries HC $3.25

The problems of the detection and identification of extended tracks of superheavy cosmic nuclei in the olivine crystals from meteorites was considered. The sensitivity of olivines to the heavy charged particles is studied. The effect of regression of latent tracks in space conditions was observed for olivines from the meteorities Lipovsky, Khutor, and Marialahti. The value is obtained for the upper limit of intensity of cosmic nuclei in the region Z is greater than or equal 70 at the level 3 to 5.10 to the minus 7th power with respect to Fe group nuclei for these crystals. Author (NSA)

N74-22434# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
MULTIPLICITY DISTRIBUTION OF SHOWER PARTICLES UNDERGROUND AND THE COSMIC RAY PRIMARY SPECTRUM
L. Bergamasco (CNR, Turin), C. Castagnoli (CNR, Turin), B. Dettore Piazzoli (CNR, Turin), P. Picchi, K. Sitte (CNR, Turin), and R. Visentin 26 Jun. 1973 8 p refs
(LNF-73/37) Avail: Aec Depository Libraries HC $3.00

Ever since the discovery of muon bundles, groups of penetrating particles with nearly parallel tracks, it has been hoped that their size and radial distribution would provide evidence on details of the processes of secondary production in high-energy collisions. An attempt is made to show, from an analysis of experimental results recently obtained, that neither the composition of the primary cosmic radiation, nor the characteristics of hadronic interactions, undergo drastic changes in the energy range above some 10 to the 15th power eV. NSA

N74-22435# Osservatorio Astronomico, Rome (Italy).
PROPOSAL FOR ULTRAVIOLET INVESTIGATIONS ON EMISSION LINES OBJECTS WITH THE IUE SATELLITE
G. B. Baratta, A. Cassatella, and R. Viotti (Lab. di Astrofis. Spaziale, Frascati, Italy) Oct. 1973 8 p refs
(RR-11) Avail: NTIS HC $4.00

Observation of emission line stars is emphasized. The observation of symbiotic stars and related objects with high and low dispersion and the purpose of line identification and measurements of absolute intensities of emission lines in order to derive the electron density and temperature, chemical composition, and circumstellar extinction are outlined. A preliminary list of stars proposed for UV observations, selected according to the operational requirements of the IUE satellite is given. Operational requirements are proposed. ESRO

N74-22436# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THE MAKING OF THE FILM 'SOLAR CORONA'
Michael Beeler Feb. 1973 6 p ref Sponsored in part by ARPA
(Contract N00014-70-A-0362-0003)
(AD-773928; AI-n-276; Film-M-1) Avail: NTIS CSCL 03/2

The report discusses the film titled Solar Corona which was made August 14, 1969 through May 7, 1970 by OSO-6, one of the Orbiting Satellite Observatories. GRA

N74-22437# Harvard Coll. Observatory, Cambridge, Mass.
THE EVOLUTION OF SOLAR ACTIVE REGIONS BASED ON 8.6 MM AND OTHER SOLAR OBSERVATIONS Final Report, 1 Jan. - 30 Jun. 1973
Jorge E. Vernazza and George L. Withbroe Jul. 1973 35 p refs
(Contract F19628-73-C-0141; AF Proj. 8682)
(AD-774021; AFCRL-TR-73-0643) Avail: NTIS CSCL 03/2

Extreme ultraviolet (EUV) and radio (8.6mm) observations have been analyzed in order to obtain information about the chromospheric layers of solar quiet and active regions. Correlations between EUV lines, EUV continua and 8.6 mm radiation have been obtained. On the basis of these correlations and theoretical considerations the authors suggest that as a first approximation EUV chromospheric lines are formed at the same temperatures in quiet and active regions. The increased density in active regions causes an increase in EUV chromospheric emission through a reduction in the non-LTE departure coefficients. The 8 mm brightness temperature increases in active regions because the larger optical depth causes the 8 mm radiation to be emitted from higher and hotter layers in active regions than in quiet regions. The authors also find, as expected, a good correlation between the flaring rate of active regions and their 8 mm brightness temperatures. Author (GRA)

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-22438+ Institut d'Aeronomie Spatiale de Belgique, Brussels.
STUDY OF THE UPPER ATMOSPHERE FROM SATELLITE ORBIT ANALYSIS Ph.D. Thesis - Brussels Univ. [CONTRIBUTION A L'ETUDE DE L'ATMOSPHERE TERRESTRE SUPERIEURE A PARTIR DE L'ANALYSE ORBITALE DES SATELLITES]
J. Vercheval 1973 229 p refs In FRENCH; ENGLISH summary
(Aeronomica-Acta-A-127) Avail: NTIS Avail: Issuing Activity

The limitations of known analytical theories are introduced relative to the determination of the high terrestrial atmospheric density from the analysis of artificial satellite orbital period variations. A synthesis of the solution of problems connected to atmospheric density calculation which are linked to satellite-particle interactions and to satellite orbit perturbation by forces other than the atmospheric drag is given. The physical structure behavior of mean thermosphere from density analysis obtained by new formulas was investigated. The results lead to a reduction of the discrepancy between calculated densities and those measured by different experimental techniques. These investigations should result in the construction of new models more suitable for representing the variations of the atmospheric structure at heights between 120 and 200 kilometers. Author (ESRO)

N74-22439*# Grambling Coll., La. Dept. of Chemistry.
THEORETICAL INVESTIGATION OF ISOTOPIC ANOMALY OF XENON IN CARBONACEOUS CHONDRITES AND OTHER TERRESTRIAL AND EXTRA-TERRESTRIAL SAMPLES Semiannual Status Report
Dwarka D. Sabu 15 Mar. 1974 35 p refs
(Grant NGR-19-011-012)
(NASA-CR-138139) Avail: NTIS HC $4.75 CSCL 03B

The composition of Xe released from carbonaceous chondrites between 600 and 1000 C, particularly its isotopic trapped forms, is analyzed. Data show trapped Xe to have the following forms: Xe-124, 126, 130, 131, 132, 134, and 136. Attempts were also made to explain the Xe anomaly by mass fractionation as well as determine the relationship between meteoritic trapped Xe and solar Xe. E.H.W.

N74-22440*# Kanner (Leo) Associates, Redwood City, Calif.
MARS IN THE EYES OF GEOLOGISTS
B. Konovalov Washington NASA May 1974 10 p Transl. into ENGLISH from Izv., 20 Mar. 1974 p 5, Cols. 1-4
(Contract NASw-2481)
(NASA-TT-F-15577) Avail: NTIS HC $4.00 CSCL 03B

The study of other planets to find out more about early geological development on Earth is discussed. Mars aged before our own planet and this could be useful for supplying comparative material for research. There are many similarities between the Moon, Mars and Earth, volcanic disturbance, type of rock, altitude relief, etc., which may serve for comparative information. Author

N74-22441*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SATELLITE-TRACKING AND EARTH-DYNAMICS RESEARCH PROGRAMS Semiannual Progress Report, 1 Jul. - 31 Dec. 1973
G. C. Weiffenbach 31 Dec. 1973 41 p refs
(Grant NGR-09-015-002)

(NASA-CR-138161; SAO-404-060; SAPR-29) Avail: NTIS HC $5.25 CSCL 22C

The following activities in Smithsonian Astrophysical Observatory's (SAO) earth-dynamics programs are covered: (1) satellite-tracking network operations; (2) satellite geodesy and geophysics programs; (3) atmospheric research. Approximately 46,000 successful range measurements were acquired by the SAO laser stations in Peru, South Africa, Brazil, and Arizona. The Peole satellite-tracking campaign conducted in conjunction with the Centre National d'Etudes Spatiales was completed in August 1973. The SAO network obtained 4482 validated returns of 310 arcs of Peole. These data are of particular value for obtaining more accurate gravity-field and zonal-harmonics coefficients. Author

N74-22442*# Techtran Corp., Glen Burnie, Md.
THE GAS PRODUCTION OF COMETS
W. F. Huebner Washington NASA Feb. 1974 18 p refs Transl. into ENGLISH from Z. Astrophys. (Heidelberg), v. 63, 1965 p 22-34
(Contract NASw-2485)
(NASA-TT-F-14789) Avail: NTIS HC $4.00 CSCL 03B

The gas production rates of comets, based on Whipple's icy-conglomerate model, are reinvestigated in the light of energy balance between the Sun's radiation and reradiation plus evaporation by the comet. Extinction of the sun's radiation by dust in the cometary atmosphere, in the case of comets rich in dust, can considerably influence evaporation. The estimated gas productivities for comets in which the forbidden lines have been observed are in good agreement with the production rates calculated here. A variation of Levin's formula which relates the heat of evaporation (desorption) to the brightness of a comet, is discussed. Author

N74-22443*# Scientific Translation Service, Santa Barbara, Calif.
THE SOVIET-AMERICAN SPACE EXPERIMENT
K. D. Bushuyev Washington NASA Apr. 1974 16 p Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 1, 1974 p 59-66
(Contract NASw-2483)
(NASA-TT-F-15502) Avail: NTIS HC $4.00 CSCL 22C

A description is given of the work which has been done on the Soviet-American space experiment. The compatability of search, approach, and docking facilities and the compatability of life support systems and transfer facilities are analyzed. The incompatabilities of the designs, systems, and equipment on the Soyuz and Apollo spacecraft are discussed. Author

N74-22444*# Scientific Translation Service, Santa Barbara, Calif.
LUNOKHOD-2 ON THE LUNAR CONTINENT
A. A. Gurshteyn Washington NASA Apr. 1974 27 p Transl. into ENGLISH from Priroda (USSR), no. 10, Oct. 1973 p 17-26
(Contract NASw-2483)
(NASA-TT-F-15401) Avail: NTIS HC $4.50 CSCL 03B

The scientific achievements of the Soviet Union in space research since 1957 are described. The operation of the Lunokhod spacecraft on the surface of the moon is discussed, and the geological-morphological data obtained are itemized. Author

N74-22445*# Linguistic Systems, Inc., Cambridge, Mass.
ESTIMATES OF WATER CONTENT IN THE ATMOSPHERE OF VENUS ACCORDING TO DATA FROM RADIO-ASTRONOMICAL MEASUREMENTS AND SPACE PROBES
A. Ye. Basharinov, B. G. Kutuza, D. Ya. Martynov, ed., and V. A. Bronshten, ed. Washington NASA Apr. 1974 8 p refs Transl. into ENGLISH from the book "Fizika Luny i Planet" Moscow, Nauka Press, 1972 p 375-377
(Contract NASw-2482)
(NASA-TT-F-15428) Avail: NTIS HC $4.00 CSCL 03B

Data on the water content of the atmosphere of Venus are presented. The data were collected from radioastronomical measurements and also from space probes, such as Venera-4, using the Ho-Kaufman-Thaddeus formula and Staelin's relation to determine absorption spectra in the superhigh frequency zone for constituent absorptions in the carbon dioxide gas, water vapor, and in the cloud cover. Author

N74-22446*# Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF LOW-ENERGY PARTICLES BY THE MARS-2 AND MARS-3 PLANETARY PROBES. 2: PRELIMINARY RESULTS
O. L. Vaysberg et al Washington NASA Apr. 1974 24 p refs Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 11, no. 5, Sep. - Oct. 1973 p 143-755
(Contract NASw-2481)
(NASA-TT-F-15540) Avail: NTIS HC $4.25 CSCL 03B

Data are presented on streams of charged particles with energy from 0.03 to 10 kev, obtained with Mars 2 and Mars 3 planetary probes in the solar wind during flight from Earth to Mars, in the Earth's geomagnetic trail and in the vicinity of Mars. The typical spectrum of undisturbed solar wind presented was made on 29 Jun. 1971. Its calculated parameters are: velocity of solar wind 414 km/s, proton temperature 6.45 eV, alpha particle temperature 24.3 eV, ratio of alpha particle to proton concentration 2%. Calculated values of these parameters for all measurements made each 20 min from 26 Jun. to 10 Jul. 1971 are also graphically presented, as are histograms of solar wind velocity, temperature of protons and He(++) ions, and ratios of He(++) ion to proton concentration obtained from measurements between 16 Jun. and 21 Aug. 1971. Data are also included for measurements obtained in the earth's geomagnetic trail, also shown on the Mars 3 trajectory graph. Author

N74-22447*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
WIND SPEEDS IN LOWER ATMOSPHERE OF VENUS: STATUS REPORT ON POSSIBLE MEASUREMENT VIA DIFFERENTIAL VLBI TRACKING OF ENTRY PROBES Final Report
Irwin I. Shapiro May 1972 41 p refs
(Grant NGR-22-009-694)
Avail: NTIS HC $5.25 CSCL 03B

The potential of very-long-baseline interferometry (VLBI) is examined for use in the determination of wind speeds in Venus' lower atmosphere via the differential tracking of entry probes. A simplified mathematical model is presented in detail. An incomplete error analysis based on this model permits an educated guess to be made: an uncertainty in wind speed determination of no more than about $100/t$ m/sec, where $t < 1$ is the corresponding time resolution in seconds, is an achievable goal, without the use of transponders on the miniprobes. If transponders are available on all probes, there should be little difficulty in estimating wind speeds with useful precision. Author

N74-22448*# California Univ., Berkeley. Space Sciences Lab.
DATA PROCESSING OF MARTIAN TOPOGRAPHIC INFORMATION OBTAINED FROM GROUND-BASED RADAR AND SPECTROSCOPY AND FROM MARINERS 6 AND 7. MARTIAN TOPOGRAPHY ELEVATIONS: DATA PROCESSING Final Report, 1 Feb. 1971 - 31 Jul. 1972
Kinsey A. Anderson 14 Mar. 1974 63 p refs
(Grant NGR-05-003-431)
(NASA-CR-138136; SSL-Ser-15-Issue-14) Avail: NTIS HC $6.25 CSCL 03B

Papers are presented which were published as a result of a project involving the preparation of a topographical elevation contour map of Mars from all data sources available through 1969, as well as the observation of Mars by spectroscopic methods in 1971 to provide additional pressure data for topographic information. Topics of the papers include: the analysis of large-scale Martian topography variations - data preparation from earth based radar, earth based CO_2 spectroscopy, and Mariners 6 and 7 CO_2 spectroscopy; the analysis of water content in observed Martian white clouds; and Martian, lunar, and terrestrial crusts - a three-dimensional exercise in comparative geophysics. K.M.M.

N74-22449*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
INTERDISCIPLINARY STUDIES OF SAMPLES FROM BOULDER 1, STATION 2, APOLLO 17, VOLUME 1
15 Mar. 1974 194 p refs

(Grant NGL-09-015-150)
(NASA-CR-138126: SAO-403-003) Avail: NTIS HC $12.75; Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, Massachusetts 02138 CSCL 03B

Rock samples from the Apollo 17 lunar landing site Boulder 1 were studied for their geomorphology, geochronology, and chemical composition. For individual titles, see N74-22450 through N74-22460.

N74-22450* National Aeronautics and Space Administration, Washington, D.C.
THE GEOLOGIC SETTING OF BOULDER 1, STATION 2
R. W. Wolfe (Harvard Coll. Obs., Cambridge, Mass.), H. H. Schmitt, and W. M. Muehlberger (Texas Univ., Austin) *In* Smithsonian Astrophys. Obs. Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 1-8 refs (For availability see N74-22449 13-30)
CSCL 03B

Geomorphological analysis of the Apollo 17 lunar landing site on a narrow valley in Mare Serenitatis establishes horizontal layers with faulting and tan-gray breccia intrusions. Regional stratigraphic relations of foliated and layered fragment rich breccias in bolders show a relationship to bedrock units in the North and South Massives. G.G.

N74-22451* Smithsonian Astrophysical Observatory, Cambridge, Mass.
MORPHOLOGY AND SURFACE MAPPING
Ursula B. Marvin (Harvard Coll. Obs., Cambridge, Mass.) *In its* Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 9-34 (For availability see N74-22449 13-30)
CSCL 03B

Rock specimens from Boulder 1 at the Apollo 17 lunar landing site consist of polymic breccia containing light grey matrix materials with minor dark gray zones, anorthositic clasts, dark grey aphanitic clasts, and basaltic clasts and zones. An unique clast of coarse, chalky white plagioclase and brown pyroxene was observed in one rock fragment. Materials from specimen rippled surface layers indicate the same composition as does the parent boulder. G.G.

N74-22452* Smithsonian Astrophysical Observatory, Cambridge, Mass.
PETROLOGY
D. B. Stoeser, R. W. Wolfe, J. A. Wood, and J. F. Bower *In its* Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 35-110 refs Prepared in cooperation with Harvard Coll. Obs., Cambridge, Mass. (For availability see N74-22449 13-30)
CSCL 03B

Petrological analyses of Boulder 1 rocks from the Apollo 17 lunar landing site indicate a complex polymict breccia structure consisting of lithic and breccia clasts in a matrix that ranges from friable and poorly sintered to densely welded. Observed rock structures contain dark, fine grained clasts (sometimes containing anorthositic rock) in abundance, friable breccia, and hard competent breccia. All three materials consist basically of minerals and lithic clasts from noritic and troctolitic sources, but also contain minor components of anorthositic and KREEPy materials. G.G.

N74-22453* Smithsonian Astrophysical Observatory, Cambridge, Mass.
PRELIMINARY RESULTS OF EXPERIMENTS TO DUPLICATE BOULDER TEXTURES BY THERMAL SINTERING OF POWDERS
Marie E. Hallam (Harvard Coll. Obs., Cambridge, Mass.) *In its* Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 111-120 refs (For availability see N74-22449 13-30)
CSCL 03B

Sintering and devitrification of glass powder, sintering of crystalline powder, and devitrification of glass chunks was used to simulate lithification of lunar boulder breccias in an ejecta-blanket environment. Experiments with lunar sawdust indicated that at the low pressures characteristic of an ejecta blanket, sintering or sintering/devitrification could have lithified Boulder 1 materials and produced the textural types observed in lunar rocks. G.G.

N74-22454* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MAJOR AND TRACE-ELEMENT CONCENTRATIONS IN SAMPLES FROM 72275 AND 72255
L. A. Haskin, D. P. Blanchard, R. Korotev, J. W. Jacobs, J. A. Brannon, R. S. Clark, and A. G. Herrmann (Lunar Science Inst., Houston, Tex.) *In* Smithsonian Astrophys. Obs. Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 121-130 refs (For availability see N74-22449 13-30)
CSCL 03B

Radiochemical neutron activation and atomic absorption spectra analyses on rock samples from Boulder 1 at Apollo 17 lunar landing site are reported. Analytical data are presented for Co, Sc, Hf, Zn, Cr, Ga, Rb, Cs, Ni, rare earth elements, and major elements. Samples prove unexpectedly rich in refractory trace elements. G.G.

N74-22455* Chicago Univ., Ill. Enrico Fermi Inst.
SIDEROPHILE AND VOLATILE TRACE ELEMENTS IN 72255 AND 72275
John W. Morgan, R. Ganapathy, Hideo Higuchi, and Edward Anders *In* Smithsonian Astrophys. Obs. Interdisciplinary studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 131-137 refs (For availability see N74-22449 13-30)
CSCL 03B

Neutron activation analyses for 17 elements on six rock samples from Boulder 1 at Apollo 17 lunar landing site are reported. Four of these rocks have substantial meteoritic components, judging from the approximately 100-fold enrichment in siderophiles (Ir, Re, Au, Ni, etc.) over their indigneous levels in crystalline highland rocks. Author

N74-22456* Australian National Univ., Canberra. Dept. of Geophysics and Geochemistry.
Rb-Sr AGE OF THE CIVET CAT CLAST, 72255, 41
W. Compston and C. M. Gray *In* Smithsonian Astrophys. Obs. Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 139-144 ref (For availability see N74-22449 13-30)
CSCL 03B

Plagioclase rich clasts, orthopyroxene rich matrix, purified pyroxene, and plagioclase from the Civet Cat clast define a Rb-Sr isochron age of 4.18 + or - 0.04 x 10 to the 9th power yr and an initial Sr-87/Sr-86 ratio of 0.69922 + or - 0.00005. Author

N74-22457* Geological Survey, Denver, Colo.
U-Th-Pb SYSTEMATICS
P. D. Nunes and M. Tatsumoto *In* Smithsonian Astrophys. Obs. Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 145-148 ref (For availability see N74-22449 13-30)
CSCL 03B

Apollo 17 landing site boulder samples were analyzed for U, Th, and Pb concentrations and for Pb isotopic compositions. Element concentration data and associated high U-238/Pb-204 ratios of dark rind and white interior materials indicated that these rocks were derived from U-rich source regions and are very different from Apollo 17 mare basalts. G.G.

N74-22458* California Univ., Berkeley. Dept. of Physics.
TRACK STUDIES OF SAMPLES 72255 AND 72275
I. D. Hutcheon *In* Smithsonian Astrophys. Obs. Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 149-152 (For availability see N74-22449 13-30)
CSCL 03B

Optical microscopic studies of two intermediate pieces of 72255, located 1 to 3 cm below the surface, indicate an upper limit to the track exposure age of 15 to 20 m.y. A striking feature of the track studies of breccias 72255 and 72275 is the peculiar etching behavior of many of the feldspar and olivine crystals. After standard etching procedures, crystal surfaces are frequently irregular and bumpy, presumably owing to nonuniform

dissolution of the surface. Microprobe analysis on another Apollo 17 boulder chip similarly afflicted has revealed no apparent chemical differences between normal and peculiar areas. Fission-track dating of a whitlockite crystal in 72255 yields an uncorrected track retention age of 3.9 to 4.0 b.y. Author

N74-22459* Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
A PRELIMINARY REPORT ON THE MAGNETIC MEASUREMENTS OF SAMPLES 72275 AND 72255
S. K. Banerjee *In* Smithsonian Astrophys. Obs. Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 153-156 (For availability see N74-22449 13-30)
CSCL 03B

Equatorial projection of the NRM vector directions for two lunar rock samples from Apollo 17 lunar landing site Boulder 1 show a difference of about 100 deg to each other. An 80 day storage test in zero field did not produce decay of NRM with time and it is tentatively concluded that the two rocks were probably magnetized at an angle to each other at different times. G.G.

N74-22460* Massachusetts Inst. of Tech., Cambridge. Planetary Astronomy Lab.
SPECTRAL REFLECTANCE OF 72275 FROM BOULDER 1, STATION 2, APOLLO 17
John B. Adams (Fairleigh Dickinson Univ., St. Croix, Virgin Islands) and Thomas B. McCord *In* Smithsonian Astrophys. Obs. Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Vol. 1 15 Mar. 1974 p 157-160 refs (For availability see N74-22449 13-30)
CSCL 03B

Spectral reflectance measurements on a lunar rock sample from the Apollo 17 landing site Boulder 1 show prominent absorption bands arising from Fe2(+) in pyroxene, with a dominance of orthopyroxene. The depths of the observed bands are large enough to preclude the presence of much glass or opaque materials in the sample. G.G.

N74-22461*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE SECOND ORDER GRAVITATIONAL REDSHIFT: TRACKING ANALYSIS STUDY Final Report
Jack Jaffe and Robert F. C. Vessot Oct. 1973 40 p refs
(Grant NGR-09-015-205)
(NASA-CR-138112; SAO-310-057) Avail: NTIS HC $5.00 CSCL 03A

A first-phase, perturbation analysis is presented for the tracking requirements necessary for the measurement of the second-order redshift in a heliocentric probe experiment. The clock performance required for such an experiment is also investigated. Author

N74-22462*# California Univ., Berkeley. Space Science Lab.
PETROGRAPHIC AND CRYSTALLOGRAPHIC STUDY OF SILICATE MINERALS IN LUNAR ROCKS Final Report, 1 Feb. 1971 - 31 Jan. 1972
I. S. E. Carmichael, F. J. Turner, and H.-R. Wenk 25 Mar. 1974 54 p refs
(Grant NGR-05-003-414)
(NASA-CR-138147; SSL-SER-15-Issue-17) Avail: NTIS HC $5.75 CSCL 03B

Optical U-stage measurements, chemical microprobe data, and X-ray procession photographs of a bytownite twin group from rock 12032,44 are compared. Sharp but weak b and no c-reflections were observed for this An89 bytownite indicating a partly disordered structure. Euler angles, used to characterize the orientation of the optical indicatrix, compare better with values for plutonic than for volcanic plagioclase. This indicates that structural and optical properties cannot be directly correlated. Author

N74-22463# Joint Publications Research Service, Arlington, Va.
SPACESHIP DOCKINGS AND PROBLEMS OF WEIGHTLESSNESS
L. Golovkin and P. Vasilyev 17 Apr. 1974 15 p Transl. into ENGLISH from Aviats. Kosmonavt. (Moscow), no. 9, no. 10, 1973
(JPRS-61771) Avail: NTIS HC $4.00

Aeromedical problems of weightlessness and the transfer of spacecrews between Soyus and Apollo spacecrafts are discussed. For individual titles, see N74-22464 through N74-22465.

N74-22464 Joint Publications Research Service, Arlington, Va.
DISCUSSION OF PROBLEMS OF WEIGHTLESSNESS
P. Vasilyev *In its* Spaceship Dockings and Probl. of Weightlessness (JPRS-61771) 17 Apr. 1974 p 1-7 Transl. into ENGLISH from Aviats. Kosmonavt. (Moscow), no. 9, Sep. 1973 p 36-37 (For availability see N74-22463 13-30)

The biological effects of weightlessness exposure on man during prolonged space flights are elaborated. Restructuring responses in the human regulation of circulation and water/mineral metabolism, onset of cardiovascular and bone-muscle system deconditioning, and a change in total resistance of the body to different environmental factors are observed. Postflight studies on cosmonauts show that adaptation/readaptation to earth-space and space-earth cycle conditions requires stressing of the body adaptation mechanisms. G.G.

N74-22465 Joint Publications Research Service, Arlington, Va.
PROBLEMS IN DOCKING OF SPACESHIPS
L. Golovkin *In its* Spaceship Dockings and Probl. of Weightlessness (JPRS-61771) 17 Apr. 1974 p 8-12 Transl. into ENGLISH from Aviats. Kosmonavt. (Moscow), no. 10, 1973 p 30-31 (For availability see N74-22463 13-30)

The complexities of transfer of cosmonauts are discussed when the ships have atmospheres of different composition and pressure. Author

N74-22466*# Scientific Translation Service, Santa Barbara, Calif.
MEASUREMENT OF A VARIABLES IN THE INTEGRAL ELECTRON CONCENTRATION ON THE MARS-2 COMMUNICATION LINE BY THE DISPERSION INTERFEROMETER METHOD
N. A. Savich, V. V. Andreyanov, Yu. I. Bekhterev, M. B. Vasilyev, A. S. Vyshlov, Yu. M. Kruglov, V. V. Nagornykh, Yu. A. Nadzharov, L. V. Onishchenko, and A. A. Pilat Washington NASA May 1974 13 p refs Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 11, no. 5, 1973 p 756-760
(Contract NASw-2483)
(NASA-TT-F-15541) Avail: NTIS HC $4.00 CSCL 03B

Variations in the integral electron concentration of the space plasma delta N sub n were measured by a two-frequency dispersion interferometer which was placed on the station Mars 2. The experimental data for 16 measurement sessions, which were carried out on the interplanetary section of the flight, are represented in the form of graphs, showing the dependence on time. In two sessions, very large and rapid variations were recorded with change rates which explained by the effects of the interplanetary plasma. It is shown that these events could be caused either by pulsed corpuscular streams or by the sectorial structure of the solar wind which intersected the communication line during the measurement session. Author

N74-22467*# Kanner (Leo) Associates, Redwood City, Calif.
MARS-3: ASTROPHYSICAL STUDY OF THE LOWER ATMOSPHERE AND PLANET SURFACE
V. I. Moroz, L. V. Ksanfomaliti, and A. E. Nadzhip Washington NASA Apr. 1974 6 p refs Transl. into ENGLISH from Usp. Fiz. Nauk (USSR), v. 111, no. 3, Oct. 1973 p 360-370 Sponsored by NASA
(NASA-TT-F-15543) Avail: NTIS HC $4.00 CSCL 03B

Results were reported from the following four Mars-3 experiments: (1) infrared brightness temperature measurements of Mars surface in 8-40 micrometers range; 2) Mars surface-relief determination from intensity variation of CO2 quanity in micrometers absorption band; 3) H2O content in atmospheric measurement from intensity of 1.38 micrometers absorption band; 4) planet photometry in 5 narrow spectral bands within 3700-7000 A range. Thermal inertia constant of Martian ground was about 0.006 cal/sq cm sec to -1/2 power/deg. This is typical of dry dust at low pressure. Temperature difference between dark (warmer) and light surface areas was approximately 10-15 C.

In polar cap areas, temperatures close to CO2 condensation temperature were recorded. A dust storm created an anti-greenhouse effect. Altitudes along ground observation tracks varied from -2 to 5 km. Cloud altitude during the dust storm was of the order of 10 km. Water content was very low - a few micrometers of precipitable water from Dec. to Feb. Author

N74-22468*# New Mexico Univ., Albuquerque. Dept. of Geology.
ELECTRON MICROPROBE ANALYSES OF LITHIC FRAGMENTS AND THEIR MINERALS FROM LUNA 20 FINES Special Publication No. 12
George H. Conrad, Paul F. Hlava, Jonathan A. Green, R. B. Moore, Grover Moreland, Eric Dowty, Martin Prinz, Klaus Keil, C. E. Nehru, and T. E. Bunch 1973 64 p refs
(Grant NGL-32-004-063)
(NASA-CR-138148) Avail: NTIS HC $6.25 CSCL 03B

The bulk analyses (determined with the broad beam electron microprobe technique) of lithic fragments are given in weight percentages and are arranged according to the rock classification. Within each rock group the analyses are arranged in order of increasing FeO content. Thin section and lithic fragment numbers are given at the top of each column of analysis and correspond to the numbers recorded on photo mosaics on file in the Institute of Meteoritics. CIPW molecular norms are given for each analysis. Electron microprobe mineral analyses (given in oxide weight percentages), structural formulae and molecular end member values are presented for plagioclase, olivine, pyroxene and K-feldspar. The minerals are selected mostly from lithic fragments that were also analyzed for bulk composition. Within each mineral group the analyses are presented according to the section number and lithic fragment number. Within each lithic fragment the mineral analyses are arranged as follows: Plagioclase in order of increasing CaO; olivine and pyroexene in order of increasing FeO; and K-feldspar in order of increasing K2O. The mineral grains are identified at the top of each column of analysis by grain number and lithic fragment number. Author

N74-22469*# Yale Univ., New Haven, Conn.
SOME CALCULATIONS PERTAINING TO THE FEASIBILITY OF MEASURING LUNAR HEAT FLOW Final Report
Sydney P. Clark, Jr. Sep. 1965 46 p refs
(Grant NGR-07-004-039)
(NASA-CR-138133) Avail: NTIS HC $5.50 CSCL 03B

A number of problems related to the feasibility of measuring lunar heat flow at the lunar surface or in a shallow hole were investigated. Steady periodic temperatures in the lunar material gave unambiguous information about its properties only if the surface material alone had an appreciable effect on the amplitude and phase of the thermal wave. Layering tended to reduce the amplitude of the fluctuation at a given depth. High amplitude fluctuations near a place where the poorly conducting surface layer was missing did not penetrate far and posed no difficulty. Large perturbations of heat flow were caused by irregularities in thickness of the surface layer, and a number of closely spaced measurements at a given landing site was required to minimize this source of error. The blanket method of measuring lunar heat flow was not considered feasible because of the necessity of very closely matching the local albedo with the blanket.
Author

N74-22470*# Toledo Univ., Ohio. Ritter Astrophysical Research Center.
THE ALBEDO OF PARTICLES IN REFLECTION NEBULAE
William F. Rush 10 Jan. 1974 28 p refs
(Grant NGR-36-010-016)
(NASA-CR-138134) Avail: NTIS HC $4.50 CSCL 03B

The relation between the apparent angular extent of a reflection nebula and the apparent magnitude of its illuminating star was reconsidered under a less restrictive set of assumptions. A computational technique was developed which permits the use of fits to the observed m-log a values to determine the albedo of particles composing reflection nebulae, providing only that a phase function and average optical thickness are assumed. Multiple scattering, anisotropic phase functions, and illumination by the general star field are considered, and the albedo of reflection nebular particles appears to be the same as that for interstellar particles in general. The possibility of continuous fluorescence contributions to the surface brightness is also considered.
Author

N74-22471*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHOTODOCUMENTATION OF LONG-TERM LUNAR SURFACE EXPOSURE EXPERIMENT
Friedrich Hoerz Feb. 1974 59 p refs
(NASA-TM-X-58125; JSC-08676) Avail: NTIS HC $6.00 CSCL 03B

Preflight photographs of selected Apollo 17 equipment taken for use in determining the effects on various surfaces of long-term exposure to the lunar environment are presented. Photographs of the articles deployed on the lunar surface also are included. The photographic procedure and the coding system used for the photodocumentation are explained. Other documentation measures planned to obtain items for use as controls in projected analyses are discussed. Author

N74-22472*# Scientific Translation Service, Santa Barbara, Calif.
INDICATIONS OF THE ERUPTIVE DEVELOPMENT OF PLANETARY BODIES
S. K. Vsekhsvyatskiy, ed. Washington NASA Jun. 1974 36 p refs Transl. into ENGLISH from the book "Problemy Kosmicheskoy Fiziki" Kiev, Kiev Univ. Press, 1971 p 73-94
(Contract NASw-2483)
(NASA-TT-F-15519) Avail: NTIS HC $5.00 CSCL 03B

The problems of comet astronomy, of the mean densities of planets, of the specific planets rotational energy, of the geological processes scale, of the manifestations of volcanic activities of the planets are discussed for the evaluation of matter and energy losses of solar system planetary bodies. It is shown that these losses may be of order of 10 to the 29th power-10 to the 31st power G 10 to the 43rd power - 10 to the 45th power erg during the period of the existence of the solar system planets. The deduction is made that the planets began life as bodies of stellar nature with very great supply of energy of the hot stellar matter. Author

N74-22473*# Alaska Univ., College.
ACTIVE EXPERIMENTS IN SPACE IN CONJUNCTION WITH SKYLAB Final Report
Eugene M. Wescott May 1974 67 p refs
(Grant NGR-02-001-088)
(NASA-CR-138164) Avail: NTIS HC $6.50 CSCL 22C

Two papers are presented which relate to the Skylab barium shaped charge experiments. The first describes the L = 6.6 OOSIK barium plasma injection experiment and magnetic storm of March 7, 1972. Rocket payload, instrumentation, data reduction methods, geophysical environment at the time of the experiment, and results are given. The second paper presents the observation of an auroral Birkeland current which developed from the distortion of a barium plasma jet during the above experiment. K.M.M.

N74-22474*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RETENTION AND APPLICATION OF SKYLAB EXPERIMENT EXPERIENCES TO FUTURE PROGRAMS
Nancy Milly and Victor G. Gillespie 1 May 1974 53 p
(NASA-TM-X-64839) Avail: NTIS HC $5.75 CSCL 22C

Problems encountered on Skylab Experiments are listed in order that these experiences and associated recommendations might help to prevent similar problems on future programs. The criteria for selection of the data to be utilized was to identify the problem areas within the Skylab Program which would be of major significance with respect to future programs. Also, the problem had to be unique in that it would help identify to a designer/manufacturer an unforeseen or unanticipated occurrence which could cause failures, delays, or additional cost. Only those unexpected problems that may occur due to the nature of aerospace experiment environmental and operational requirements are included. Author

N74-22475*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE RESEARCH IN THE UKRAINE. PART 2: SPACE MECHANICS AND CONTROL SYSTEMS
Yu. A. Mitropolskiy, ed. Washington NASA May 1974 147 p

refs Transl. into ENGLISH of the book "Kosmicheskiye Issledovaniya na Ukraine. Vypusk 2, Kosmicheskaya Mekhanika i Upravlyayushchiye Sistemy" Kiev, Naukova Dumka, 1973 p 1-91
(Contract NASw-2481)
(NASA-TT-F-15536) Avail: NTIS HC $10.50 CSCL 22C

Articles are presented on urgent problems in space mechanics and the control of space objects. Problems of oscillations, stability, and stabilization of flight craft are discussed along with trajectory problems of the injection of spacecraft into orbits. Problems of the orbital attitude change of similar artificial earth satellites (AES), orientation of space flight craft, and the aerodynamics of AES are also discussed. Author

N74-22476*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RECOMMENDED RADIATIVE PROPERTY DATA FOR VENUSIAN ENTRY CALCULATIONS
J. J. Jones, R. E. Boughner, K. V. Haggard, J. E. Nealy, D. R. Schryer, and E. V. Zoby May 1974 130 p refs
(NASA-TM-X-71961) Avail: NTIS HC $9.50 CSCL 03B

A compilation of experimental and calculated data on the radiative properties species important in Venusian entry is presented. Molecular band systems, atomic lines, free-bound, and free-free continua are considered for the principal radiating species of shock heated carbon dioxide. A limited amount of data pertinent to the species in the ablation layer is also included. The assumption is made that the Venus atmosphere so closely approximates pure CO_2 that the inviscid layer radiation is due almost entirely to thermally excited CO_2. The only exception is the inclusion of data on the Violet band system of CN. Recommendations are made as to best property values for radiative heating calculations. A review of the basic equations and the relationships of the various emission-absorption gas porperties is also included. Author

N74-22477*# LTV Aerospace Corp., Dallas, Tex.
STATISTICAL TRAJECTORY ESTIMATION PROGRAM (STEP) IMPLEMENTATION FOR BLDT POST FLIGHT TRAJECTORY SIMULATION
Williams E. Shields [1973] 44 p refs
(Contract NAS1-10900)
(NASA-CR-132427) Avail: NTIS HC $5.25 CSCL 22C

Tests were conducted to provide flight conditions for qualifying the Viking Decelerator System in a simulated Mars environment. A balloon launched decelerator test (BLDT) vehicle which has an external shape similar to the actual Mars Viking Lander Capsule was used so that the decelerator would be deployed in the wake of a blunt body. An effort was made to simulate the BLDT vehicle flights from the time they were dropped from the balloon, through decelerator deployment, until stable decelerator conditions were reached. The procedure used to simulate these flights using the Statistical Trajectory Estimation Program (STEP) is discussed. Using primarily ground-based position radar and vehicle onboard rate gyro and accelerometer data, the STEP produces a minimum variance solution of the vehicle trajectory and calculates vehicle attitude histories. Using film from cameras in the vehicle along with a computer program, attitude histories for portions of the flight before and after decelerator deployment were calculated independent of the STEP simulation. With the assumption that the vehicle motions derived from camera data are accurate, a comparison reveals that STEP was able to simulate vehicle motions for all flights both before and after decelerator deployment. Author

N74-22478*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRIANGULATION OF MULTISTATION CAMERA DATA TO LOCATE A CURVED LINE IN SPACE
Clifford L. Fricke Washington May 1974 42 p refs
(NASA-TN-D-7538; L-9268) Avail: NTIS HC $3.25 CSCL 14E

A method is described for finding the location of a curved line in space from local azimuth as a function of elevation data obtained at several observation sites. A least-squares criterion is used to insure the best fit to the data. The method is applicable to the triangulation of an object having no identifiable structural features, provided its width is very small compared with its length so as to approximate a line in space. The method was implemented with a digital computer program and was successfully applied to data obtained from photographs of a barium ion cloud which traced out the earth's magnetic field line at very high altitudes. Author

N74-22479*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SKYLAB SHORT-LIVED EVENT ALERT PROGRAM Final Report
Robert A. Citron Feb. 1974 30 p
(Contract NAS9-13474)
(NASA-CR-134262) Avail: NTIS HC $4.50 CSCL 22C

During the three manned Skylab missions, the Center for Short-Lived Phenomena (CSLP) reported a total of 39 significant events to the Johnson Space Center (JSC) as part of the Skylab Short-Lived Event Alert Program. The telegraphed daily status reports included the names and locations of the events, the track number and revolution number during which the event could be observed, the time (GMT) to within plus or minus 2 sec when Skylab was closest to the event area, and the light condition (daylight or darkness) at that time and place. The messages sent to JSC during the Skylab 4 mission also included information pertaining to ground-truth studies and observations being conducted on the events. Photographic priorities were assigned for each event. Author

N74-22480*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB 3 AND 4 SCIENCE DEMONSTRATIONS: PRELIMINARY REPORT
Tommy C. Bannister May 1974 32 p
(NASA-TM-X-64835) Avail: NTIS HC $3.25 CSCL 22C

Twelve science demonstrations were accomplished on the Skylab 3 and 4 missions. These were defined in response to crew requests for time-gap fillers and were designed to be accomplished using onboard equipment. The following 12 are described and the preliminary results are given: liquid floating zone; diffusion in liquids; ice melting; immiscible liquids; liquid films; gyroscope; Rochelle salt growth; deposition of silver crystals; fluid mechanics series; neutron environment; orbital mechanics; and charged particle mobility. Author

N74-22481# Joint Publications Research Service, Arlington, Va.
SOVIET BLOCK RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 323
26 Apr. 1974 63 p refs Transl. into ENGLISH of RUSSIAN reports
(JPRS-61845) Avail: NTIS HC $6.25

Abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports. Details of Soviet space spectaculars are included. Author

N74-22482*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOPPLER FACTORS IN SATELLITE-TO-SATELLITE TRACKING
John W. Marini Apr. 1974 18 p refs
(NASA-TM-X-70638; X-932-74-93) Avail: NTIS HC $4.00 CSCL 22C

The Doppler factors occurring in range rate satellite-to-satellite tracking measurements are derived with special relativistic effects included. The error resulting from the use of simplified expressions for these factors is discussed. Author

N74-22483*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 13th ORDER RESONANCE FROM NAVY TRACKING ON A DIADEME 2 FRAGMENT
C. A. Wagner Mar. 1974 34 p refs Submitted for publication
(NASA-TM-X-70636; X-920-74-88) Avail: NTIS HC $4.75 CSCL 22C

A strong constraint on 13th order (odd degree) terms in the geopotential has been derived from Navy tracking on a

DIADEME 2 fragment (1967-14F). This object (perigee height: 580 km, orbit inclination: 38.9 deg) is presently decaying slowly through perfect commensurability with these terms. The resonance forces will increase its inclination by 0.02 deg when the passage is complete by late 1974. The constraint (lumped harmonics), derived by adjustment of a pair of harmonic coefficients to the Navy inclination data (principally) is: 10 to the 9th power (14.8 + or - 0.8, 48.3 + or - 0.7) = 0.023(C,S)13, 13 -0.172(C,S)15,13 0.505(C,S)17,13 - 0.884(C,S)19,13 + (C,S)21,13 0.673(C,S)23,13 0.099(C,S)25,13 0.295(C,S)27,13 -0.279(C,S)29,13 0.018(C,S)31,13 + There should be a significant contribution to this result from terms as high as 29th degree. But current geopotential solutions (for 13th order terms) to this degree are about 20% in error when judged by this independent data. Author

N74-22484*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STUDIES OF THE MAJOR PLANET SATELLITE SYSTEMS
Herbert Frey and Paul D. Lowman Apr. 1974 57 p refs Submitted for publication
(NASA-TM-X-70642; X-922-74-112) Avail: NTIS HC $6.00 CSCL 03B

A summary is presented of the available data on the satellites of the major planets, including the currently most plausible models for several observed phenomena, for the planning of spacecraft missions to these objects. Some of the important questions likely to be solved by flyby and/or orbital missions to the giant planets are detailed, the importance of these studies to our understanding of the solar system as a whole is indicated. Author

N74-22485# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Dec. 1973
Massimo Cimino Dec. 1973 9 p
(Publ-188) Avail: NTIS HC $4.00

Solar data December 1973 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification, and area of sunspot groups; longitudinal sunspot magnetic fields; and hours of K-line cinematographic patrol. ESRO

N74-22486# Owens Valley Radio Observatory, Pasadena, Calif.
A STUDY OF THE HI ABSORPTION IN THE GALAXY M82 BY RADIO INTERFEROMETRY
L. Weliachew 1973 26 p refs
(Contract N00014-67-A-0094-0019; Grant NSF GP-30400)
(AD-773573; Rept-1973-16) Avail: NTIS CSCL 03/2

The continuum source located in the IrrII galaxy M82 has been studied in HI absorption at 21 cm wavelength. Absorption by gas located in M82 has been detected and mapped with an east-west interferometer. The maximum baseline length was approximately 4500 lambda. The velocity resolution was 21 km/sec. The positions of fifteen velocity centroids of the HI absorption have been determined to within 1-3 arc sec accuracy relative to one another. This allows direct comparison with a recent optical study (Heckathorn 1972). For the first time agreement is found between the systemic velocities of M82 determined by optical and radio methods. Several features of the velocity field are discussed particularly in the framework of the dust-scattering models recently proposed for M82. (Modified author abstract) GRA

N74-22487*# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PLASMA TURBULENT REACTORS IN COLLAPSARS
S. A. Kaplan and V. N. Tsytovich 17 Dec. 1973 13 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Fiz. Inst. (Moscow), no. 56, 1973 p 1-8
(AD-773267; FTD-HT-23-201-74) Avail: NTIS CSCL 03/2

According to existing concepts, black holes (or collapsars) can be observed thanks to X-ray radiation occurring in their matter (accretion). In this report the authors point out the consequences to which computation of the probability of excitation of the plasma turbulence will lead. GRA

N74-22488*# Owens Valley Radio Observatory, Pasadena, Calif.
THE POSITION AND STOKES PARAMETERS OF THE INTEGRATED 21 cm RADIO EMISSION OF JUPITER AND THEIR VARIATION WITH EPOCH AND CENTRAL MERIDIAN LONGITUDE
Glenn L. Berge 1973 35 p refs
(Grant NGR-005-002-114; Contract N00014-67-A-0094-0019; Grant NSF GP-30400)
(NASA-CR-138163; AD-773572; Rept-1973-17) Avail: NTIS HC $4.75 CSCL 03/2

Interferometer observations of Jupiter using short antenna spacings were made in 1968 and 1970 at 21.1 cm wavelength and in 1971 at 18.7 cm. The flux density, centroid position, and complete polarization state of the integrated emission were determined at many different central meridian longitudes. A small displacement of the emission centroid from the center of the planet may have been detected. Of greater importance, perhaps, is that a displacement larger than about 0.15 radii is ruled out. The observations confirm the slow decrease in flux density over a period of years, and extend the time base to eleven years, during which there has been no start of a recovery from the decline. The variation of flux density and polarization with central meridian longitude changed character in several respects from earlier observations. Some, but not all of these changes can be explained by the change in our aspect angle since the earlier observations. Author (GRA)

N74-22489# Aerospace Corp., El Segundo, Calif. Lab. Operations.
BL Lac (VRO 42.22.01): SIMULTANEOUS RADIO AND OPTICAL OBSERVATIONS
B. H. Andrew, G. A. Harvey, W. J. Medd, K. R. Hackney, R. L. Hackney, R. L. Scott, A. G. Smith, R. J. Leacock, B. Q. McGirnsey, E. E. Epstein et al 20 Dec. 1973 15 p refs
(Contract F04701-73-C-0074)
(AD-773841; TR-0074(9230-03)-5; SAMSO-TR-74-3) Avail: NTIS CSCL 03/2

During August and September 1972, simultaneous optical and radio observations were made of BL Lac (VRO 42.22.01) in an attempt to find correlated variations. The optical and radio variations have similar time scales but the evidence for correlation is inconclusive. The rapid variations at radio wavelengths are highly polarized and seem to originate in a region that is optically thin and has a highly ordered magnetic field. Author (GRA)

N74-22490# Aerospace Corp., El Segundo, Calif. Lab. Operations.
TIME VARIATIONS IN THE OH MICROWAVE AND INFRARED EMISSION FROM LATE TYPE STARS
Paul M. Harvey, Kenneth P. Bechis, William J. Wilson, and John A. Ball 1 Dec. 1973 81 p refs
(Contract F04701-73-C-0074)
(AD-773309; TR-0074(9230-03)-3; SAMSO-TR-73-401) Avail: NTIS CSCL 03/2

The OH microwave and infrared variability of 14 OH/IR stars were studied. Many of the sources show periodic flux variations between 1 and 10 micrometer and in the 1612-MHz OH lines with no appreciable phase difference between the infrared and microwave. The best explanation for this correlation seems to be that the OH masers are radiatively pumped. In at least two sources the 1665- and 1667-MHz variations are significantly greater and more random than in the 1612-MHz sources. These data are not of sufficient quality to determine if the 1665/1667-MHz and infrared variations are significantly correlated. A correlation does exist between the period of variation, the amplitude of variation at 2.2 micrometers, the (3.5 micrometers) - (10 micrometers) color index, the separation in velocity of the two OH emission features, and the existence of 1.35 cm H2O emission in the Mira type stars observed. No evidence is seen in the infrared for periodic variations of the color temperature of the circumstellar shells which are believed to surround many of these stars. Author (GRA)

N74-22491# Old Dominion Systems, Inc., Gaithersburg, Md.
A PHOTOGRAMMETRIC AND TRACKING NETWORK ANALYSIS PROGRAM Final Report
John G. Hartwell, Fred M. Loveless, and George E. Morduch Oct. 1973 147 p refs
(Contract DAAK02-72-C-0434; DA Proj. 4A6-63712-D-855)

(AD-774809; ETL-CR-73-17) Avail: NTIS CSCL 22/3

The Photogrammetric and Tracking Network Analysis Program (FOTONAP) is a rigorous general purpose long arc multi satellite orbit determination and parameter estimation program. It is capable of simultaneously processing photogrammetric observations collected by an orbiting camera along with observations from conventional ground based and satellite to satellite tracking systems. In addition to the recovery of satellite orbits the program provides estimates for the relative location of ground points (observed by the orbiting camera), various camera error model parameters, the location of ground based tracking systems, plus an ensemble of error model parameters associated with the various tracking instruments. The entire program is written in FORTRAN and is operational under the SCOPE 3.3/3.4 system on the CDC 6600 computer system. Author (GRA)

N74-22492# Naval Weapons Lab., Dahlgren, Va.
MATHEMATICAL FORMULATION FOR PRE-LAUNCH ANALYSES OF THE SOLRAD-HI SATELLITE SYSTEM
Bruce Herman and Everett Swift Nov. 1973 33 p refs
(AD-774913; NWL-TR-3070) Avail: NTIS CSCL 22/3

Two SOLRAD-HI satellites are to be placed into synchronous orbit by a single launch vehicle in the Spring of 1975. Their ultimate destinations are similar 5.4 day circular orbits with spacing between satellites of 180 degrees. The restrictions and constraints placed on the launch sequence from synchronous to final orbit are reviewed. Included are some basic formulations intended to serve as a guide to the methods employed in the analysis. Author (GRA)

N74-22493# California Univ., Los Angeles. Dept. of Astronomy.
SPECTROPHOTOMETRIC STUDIES OF FAINT ASTRONOMICAL SOURCES WITH IMAGE TUBES Final Report, 1 Apr. 1969 - 31 Mar. 1972
Harland W. Epps 9 Nov. 1973 21 p refs
(Contract F19628-69-C-0153; AF Proj. 8608)
(AD-774647; AFCRL-TR-73-0762) Avail: NTIS CSCL 03/1

The Robinson-Wampler image tube scanner, the Beaver-Digicon and direct coupled electrostatic image tubes are used as spectrophotometric detectors to study a variety of objects including a quasi-stellar source, extra galactic planetary nebulae, galactic planetary nebulae and H alpha emission line stars in the Large Magellanic Cloud. Direct coupled electrostatic image tubes are applied to a survey of the infrared component of Cygus OB2 and to the search for planetary nebulae in Local Group elliptical galaxies. A compilation of specific results is cited in the literature. Author (GRA)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N74-22494*# Aerospace Corp., El Segundo, Calif. Systems Planning Div.
PROGRAMMATIC EFFECTS OF UTILIZING VARIOUS SPACE TUG OPTIONS Study 2.6 Interim Report
L. T. Stricker Jul. 1973 66 p refs
(Contract NASw-2472)
(NASA-CR-138141; ATR-74(7336)-2) Avail: NTIS HC $6.50 CSCL 22B

The results are summarized of the computerized (DORCA) analyses of a number of NASA/Non-NASA and DoD payload mission models that have been used in conjunction with studies of the Space Transportation System (STS). The first analysis performed was on the 1971 NASA/Non-NASA and DoD mission models. Subsequent to that, analyses of the June 1972 excursion to the 1971 NASA/Non-NASA mission models were performed. The mission models have two basic versions; i.e., one employing expendable payloads and another employing a best mix of expendable and reusable payloads. Both versions of the models have the same payload deployment schedule. However, in the best mix version, payloads are retrieved from orbit and whenever possible, refurbished payloads are deployed. The analyses were performed to determine the relative merits to different Tug configurations and of Tug combinations employed in several phased development schemes. Author

N74-22495*# Baganoff Associates, Inc., St. Louis, Mo.
SKYLAB 2 GROUND WINDS DATA REDUCTION AND STATISTICAL ANALYSIS Final Report, 8 Jan. 1973 - 8 Jan. 1974
18 Jan. 1974 67 p
(Contract NAS8-26703)
(NASA-CR-120208; Rept-610) Avail: NTIS HC $6.50 CSCL 22D

A ground winds test was conducted on the Skylab 2 spacecraft in a subsonic wind tunnel and the results were tape recorded for analysis. The data reduction system used to analyze the tapes for full scale, first and second mode bending moments, or acceleration plots versus dynamic pressure or wind velocity is explained. Portions of the Skylab 2 tape data were analyzed statistically in the form of power spectral densities, autocorrelations, and cross correlations to introduce a concept of using system response decay as a measure of linear system damping. Author

N74-22496# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
TIME AND FREQUENCY BROADCAST EXPERIMENTS FROM THE ATS-3 SATELLITE Final Report, 1 Aug. 1971 - 1 Aug. 1973
D. W. Hanson and W. F. Hamilton Nov. 1973 117 p refs
(NBS-TN-645) Avail: SOD HC $1.00 as C13.46:645

An experiment designed to reveal the advantages and special problems associated with the broadcasting of time and frequency information from geostationary satellites is discussed. Included are discussions concerning: (1) satellite motion, (2) time delay variation, (3) Doppler shift due to the motion, and (4) calculation of delay. Receiver or ground station equipment requirements, time recovery techniques, timing resolution and accuracy, and special advantages of satellite broadcasts for time and frequency dissemination are also discussed. Specially equipped sites in North and South America gathered data from the experimental satellite broadcast which in turn were used to determine the potential accuracy of satellite dissemination, the results of which are presented. Delay computation aids for the user were designed to provide a simple and inexpensive means of computing free space delays between the master clock and the user via a geostationary satellite. Author

N74-22497*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
THE STABILITY OF MOTION SATELLITES WITH LONG FLEXIBLE APPENDAGES Final Technical Report
Leonard Meirovitch Mar. 1974 101 p refs
(Grant NGR-47-004-098)
(NASA-CR-138153) Avail: NTIS HC $8.25 CSCL 22B

The dynamics of a gravity-gradient stabilized flexible satellite in the neighborhood of a deformed equilibrium configuration are investigated. First the equilibrium configuration is determined by solving a set of nonlinear differential equations. Then stability of motion about the deformed equilibrium is tested by means of the Liapunov direct method and the natural frequencies of oscillation of the complete structure calculated. The analysis is applicable to the RAE/B satellite. Author

N74-22498*# Chrysler Corp., New Orleans, La. Space Div.
EFFECTS OF SURFACE ROUGHNESS ON THE AERODYNAMIC CHARACTERISTICS OF THE MODIFIED 089 B SHUTTLE ORBITER AT MACH 6 (LA15)
George Ashby, Jr. (NASA. Langley Res. Center) Feb. 1974 154 p
(Contract NAS9-13247)
(NASA-CR-134083; DMS-DR-2079) Avail: NTIS HC $10.75 CSCL 22B

A one hundredth scale model of the modified 089B shuttle orbiter was tested in the Langley 20-Inch Mach 6 tunnel. Force and moment, surface pressure and oilflow data were obtained on one model, and phase-change coating data were obtained

on another. The pressure tests were conducted first; the tubes were clipped near the base of the model and then the force and moment and oil flow tests conducted. Angles of attack for the tests were from 20 deg to 35 deg and are commensurate with the range of flight values from entry down to Mach 5. The design flight Reynolds number at Mach 6, based on model length, was 15 million, which could not be obtained in the tunnel; therefore, the tests were conducted at the highest and lowest values for this model in the tunnel, 9.4 million and 4.0 million, respectively, to indicate Reynolds number effects. Two control deflection combinations, representative of the bank and pitch control limits of the design flight trajectory, were used. Author

N74-22499# Comsat Labs., Clarksburg, Md.
EFFECTS OF ASYMMETRIES IN THE ROTOR AND FLEXIBLE JOINT OF A DUAL-SPIN SPACECRAFT
B. N. Agrawal 20 Mar. 1974 35 p refs Sponsored by INTELSAT Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Sep. 1974
Avail: NTIS HC $4.75

Dynamic analysis of a statically and dynamically unbalanced dual-spin spacecraft with unequal transverse principal inertias and flexibility is discussed. It is assumed that the flexibility is in the joint between the rotor and the platform. The dependence of the natural frequencies and stability on the unequal transverse principal inertias of the rotor and the platform, unsymmetrical stiffness, and rotor spin rate is discussed in general and illustrated by numerical examples. The principal results are the effects of flexibility in lowering the nutation frequency and contributing both rotational structural frequencies and unstable regions due to unsymmetric inertia and stiffness. Author

N74-22500*# Techtran Corp., Silver Spring, Md.
OPERATIONS ON THE SMS SATELLITE
P. Foussier Washington NASA Aug. 1973 14 p Transl. into ENGLIGH of "Operations sur le Satellite SMS" Centre National d'Etudes Spatiales, Pretoria Station, Rept-73/87/PTA, 1 Jun. 1973 27 p
(Contract NASw-2485)
(NASA-TT-F-14749; Rept-73/87/PTA) Avail: NTIS HC $4.00 CSCL 22B

Theoretical and practical aspects of telemetry for the SMS are discussed. The reception, configuration, and remote control are described. F.O.S.

N74-22501*# Howard Univ., Washington, D.C. Dept. of Mechanical Engineering.
THE THREE DIMENSIONAL MOTION AND STABILITY OF A ROTATING SPACE STATION: CABLE-COUNTERWEIGHT CONFIGURATION Final Report
Peter M. Bainum and Keith S. Evans May 1974 134 p refs (Grant NGR-09-011-053)
(NASA-CR-138151) Avail: NTIS HC $9.75 CSCL 22B

The three dimensional equations of motion for a cable connected space station--counterweight system are developed using a Lagrangian formulation. The system model employed allows for cable and end body damping and restoring effects. The equations are then linearized about the equilibrium motion and nondimensionalized. To first degree, the out-of-plane equations uncouple from the inplane equations. Therefore, the characteristic polynomials for the in-plane and out-of-plane equations are developed and treated separately. From the general in-plane characteristic equation, necessary conditions for stability are obtained. The Routh-Hurwitz necessary and sufficient conditions for stability are derived for the general out-of-plane characteristic equation. Special cases of the in-plane and out-of-plane equations (such as identical end masses, and when the cable is attached to the centers of mass of the two end bodies) are then examined for stability criteria. Author

N74-22502*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STRUCTURAL EVALUATION OF CANDIDATE SPACE SHUTTLE THERMAL PROTECTION SYSTEMS Final Report
A. Bruce Burns 26 Jun. 1972 66 p refs
(Contract NAS1-11153)
(NASA-CR-132428; LMSC-D157398) Avail: NTIS HC $6.50 CSCL 22B

The characteristics and development of a lightweight reusable thermal protection system for the space shuttle are discussed. The test articles consisted of metallic substrates with upper surfaces covered with all-silica, reusable, surface insulation material. The material is processed in the form of tiles. The external surfaces of the tiles are provided with a coating system which consists of a borosilicate coating with a silicon carbide emittance agent and impregnation with a hydrophobic agent. The finished tiles are attached to the metal substrate by adhesive bonding. Charts and graphs of the properties of the material are provided. Author

N74-22503*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF INVESTIGATIONS ON A 0.010-SCALE MODEL OF THE CONFIGURATION 3 SPACE SHUTTLE ORBITER AND EXTERNAL TANK IN THE NASA/AMES RESEARCH CENTER 3.5-FOOT HYPERSONIC WIND TUNNEL (IA15)
M. T. Petrozzi (Rockwell Intern., Downey, Calif.), M. D. Milam (Rockwell Intern., Downey, Calif.), and J. A. Mellenthin (NASA Ames Res. Center) Mar. 1974 123 p
(Contract NAS9-13247)
(NASA-CR-134089; DMS-DR-2102) Avail: NTIS HC $9.25 CSCL 22B

Experimental aerodynamic investigations were conducted in a 3.5-foot hypersonic wind tunnel. The model used for this test was a 0.010-scale of the Configuration 2 Space Shuttle Orbiter and the External Tank. Six-component aerodynamic force and moment data were recorded over an angle of attack range from -8 deg to +30 deg at 0 deg and 5 deg angles of sideslip. Data was also recorded during beta sweeps of -8 deg to +10 deg at angles of attack of -10 deg, 0 deg, and 30 deg. All testing was done at Mach 7.3. Various elevon, rudder and orbiter to external tank attaching structures and fairings were tested to determine longitudinal and lateral-directional stability characteristics. Non-metric exhaust plumes were installed during a portion of the testing to determine the effects of the main propulsion system rocket plumes. Author

N74-22504*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FEASIBILITY OF SPACE DISPOSAL OF RADIOACTIVE NUCLEAR WASTE. 2: TECHNICAL SUMMARY
Washington May 1974 130 p refs
(NASA-TM-X-2912; E-7676) Avail: NTIS HC $4.75 CSCL 22A

The feasibility of transporting radioactive waste produced in the process of generating electricity in nuclear powerplants into space for ultimate disposal was investigated at the request of the AEC as a NASA in-house effort. The investigation is part of a broad AEC study of methods for long-term storage or disposal of radioactive waste. The results of the study indicate that transporting specific radioactive wastes, particularly the actinides with very long half-lives, into space using the space shuttle/tug as the launch system, appears feasible from the engineering and safety viewpoints. The space transportation costs for ejecting the actinides out of the solar system would represent less than a 5-percent increase in the average consumer's electric bill. Author

N74-22505*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF INVESTIGATIONS ON AN 0.015-SCALE CONFIGURATION 140A/B SPACE SHUTTLE VEHICLE ORBITER MODEL (49-0) IN THE NASA/LANGLEY RESEARCH CENTER 8-FOOT TRANSONIC PRESSURE TUNNEL (OA25)
M. E. Nichols (Rockwell Intern.) Feb. 1974 590 p
(Contract NAS9-13247)
(NASA-CR-134082; DMS-DR-2089) Avail: NTIS HC $32.50 CSCL 22B

Aerodynamic force and moment tests were conducted on an 0.015-scale space shuttle vehicle configuration 140A/B model (49-0) in a transonic pressure tunnel. The test was carried out at Mach numbers 0.35, 0.60, 0.80, 0.90, 0.98, and 1.20, and at Reynolds numbers ranging from 1.90 million per foot to 3.97 million per foot, depending on tunnel total pressure capability and model structural limits. The model attitude was varied in angle-of-attack from minus 2 deg to +22 deg at 0 deg and

5 deg angles of yaw, and in angle-of-sidelip from minus 5 to +10 deg at 0 deg, 7.5 deg, and 15 deg angles of pitch. The purpose of this test was to establish and verify longitudinal and lateral-directional characteristics of the 140A/B Configuration Orbiter and to determine the effects of surface deflections on vehicle performance, stability, and control. Author

N74-22506*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT THE COMMAND AND SERVICE MODULE MILESTONE REVIEW PROCESS
Harmon L. Brendle and James A. York Washington Mar. 1974 111 p
(NASA-TN-D-7599; JSC-S-389) Avail: NTIS HC $4.50 CSCL 22B

The sequence of the command and service module milestone review process is given, and the Customer Acceptance Readiness Review and Flight Readiness Review plans are presented. Contents of the System Summary Acceptance Documents for the two formal spacecraft reviews are detailed, and supplemental data required for presentation to the review boards are listed. Typical forms, correspondence, supporting documentation, and minutes of a board meeting are included. Author

N74-22507*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
REMOVAL OF SPACECRAFT-SURFACE PARTICULATE CONTAMINANTS BY SIMULATED MICROMETEOROID IMPACTS
J. H. Goad, Jr., J. D. DiBattista, D. M. Robinson, and W. P. Chu (Old Dominion Univ.) May 1974 27 p refs
(NASA-TN-D-7494; L-9269) Avail: NTIS HC $3.25 CSCL 22B

A series of hypervelocity impacts has been conducted in an exploding lithium-wire accelerator to examine with a far-field holographic system the removal of particulate contaminants from external spacecraft surfaces subjected to micrometeoroid bombardment. The impacting projectiles used to simulate the micrometeoroids were glass spheres nominally 37 microns in diameter, having velocities between 4 and 17 km/sec. The particulates were glass spheres nominally 25, 50, and 75 microns in diameter which were placed on aluminum targets. For these test, particulates detached had velocities that were log-normally distributed. The significance of the log-normal behavior of the ejected-particulate velocity distribution is that the geometric mean velocity and the geometric standard deviation are the only two parameters needed to model completely the process of particles removed or ejected from a spacecraft surface by a micrometeoroid impact. Author

N74-22508*# Chrysler Corp., New Orleans, La. Data Management Services.
WIND TUNNEL TEST RESULTS OF FAIRINGS ON A .004 SCALE MODEL ROCKWELL SPACE SHUTTLE INTEGRATED VEHICLE AERODYNAMIC CHARACTERISTICS AT MACH NUMBERS FROM 0.6 TO 4.96
Ed Allen (Rockwell Intern.) and Tom Hamilton (Rockwell Intern.) Mar. 1974 153 p
(Contract NAS9-13247)
(NASA-CR-134094; DMS-DR-2103) Avail: NTIS HC $10.75 CSCL 22B

Experimental aerodynamic investigations were conducted on a .004 scale model (34-OTS) orbiter, external tank, and solid rocket booster combined as an integrated vehicle in the NASA/MSFC 14 x 14 inch Trisonic Wind Tunnel. The primary test objective was to determine the effect of a full length orbiter/external tank fairing on axial force. Secondary objectives were to define the static stability characteristics of the mated vehicle configuration with fairing over a Mach number range of 0.6 thru 4.96. Six component aerodynamic force and moment data were recorded over an angle of attack range from minus 10 deg to 10 deg at 0 deg sideslip angle and from minus 10 deg to 10 deg sideslip range at 0 deg and 5 deg angle of attack. Plotted and tabular results are presented. Author

N74-22509*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SSME/SIDE LOADS ANALYSIS FOR FLIGHT CONFIGURATION
Wayne Holland and John Harbison 18 Feb. 1974 62 p refs
(NASA-TM-X-64841) Avail: NTIS HC $3.75 CSCL 22B

The statistical loads analysis is described for the space shuttle main engine (SSME) due to transient flow separation during ignition. The salient features of the analysis and the dynamic responses (loads and accelerations) of the engine are summarized. The results are based upon a preliminary structural model of the engine and its support structure. This analysis will be updated to include an active thrust vector control system and the most current representation of the engine and support structure backup models. Author

N74-22510*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CENTAUR STANDARD SHROUD (CSS) FULL JETTISON TEST DYNAMIC ANALYSIS
Harold J. Kasper and Richard M. Donovan Apr. 1974 53 p
(NASA-TM-X-71537; E-7943) Avail: NTIS HC $5.75 CSCL 22B

During the space power facility jettison tests, the non-domed half of the Centaur standard shroud was allowed to completely separate from its hinge connection and was caught in a horizontal catch net. A rigid body dynamic analysis that was performed to predict the half shroud prior to and after net contact is presented. Analytical predictions of the longitudinal and circumferential bending moments imposed on the half shroud by the catch net and the net pressure on the half shroud corrugated skin are also presented. Author

N74-22511*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPUTER-AIDED SPACE SHUTTLE ORBITER WING DESIGN STUDY
W. Pelham Phillips, John P. Decker, Timothy R. Rau, and C. R. Glatt (Aerophysics Res. Corp., Hampton, Va.) Washington NASA May 1974 84 p refs
(NASA-TN-D-7478; L-9099) Avail: NTIS HC $4.00 CSCL 22B

An analytical and experimental investigation has been made to provide a space shuttle orbiter wing design that met the guideline requirements of landing performance, stability, and hypersonic trim for a specified center-of-gravity envelope. The analytical study was facilitated by the use of the Optimal Design Integration system (ODIN) and the experimental part of the investigation was conducted in the Langley low-turbulence pressure tunnel and the Langley continuous-flow hypersonic tunnel. Author

N74-22512# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES. NOVEMBER 1973
R. D. Eberst 12 Dec. 1973 35 p
(ROE-STS-163) Avail: NTIS HC $4.75

Stopwatch observations made at stations during November 1973 are listed in satellite launch and time order: 705 fully reduced observations of 151 satellites. Author (ESRO)

N74-22513# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
ROTADOT OBSERVATIONS MADE AT EARLYBURN. OCTOBER 1973
K. S. Russell 25 Jan. 1974 41 p
(ROE-STS-164) Avail: NTIS HC $5.25

Timed azimuth and elevation observations of satellites, made with ROTADOT at Earlyburn Outstation, are listed. Author (ESRO)

N74-22514# Illinois Univ., Urbana. Dynamics Lab.
SIDE VECTOR CONTROL THROUGH JET WALL INTERACTIONS IN SEGMENTED EJECTOR NOZZLES Final Report
H. H. Korst and R. A. White Sep. 1973 53 p refs
(Contract DAAH01-72-C-0781)
(AD-775486) Avail: NTIS CSCL 16/4

It has been suggested that a non-symmetrical supply of secondary air to an ejector nozzle and consequent deflections of the primary jet could be used as a method of side vector control.

Experimental support for this scheme has been sought; however, it did not indicate that significant side forces could be achieved. The investigation aimed at the theoretical analysis and experimental verification of side vector forces produced in segmented short-shroud ejectors by controlled admission of secondary air. GRA

N74-22515# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
MODULAR WEAPON SYSTEM AERODYNAMIC CONFIGURATION AND COMPONENT DEFINITION STUDY Final Study, Oct. 1972 - Apr. 1973
Arthur Nitikman, John Moore, George Fulton, James Putman, Alson Frazer, Everett Schafer, George Fulton, and Richard Morenus May 1973 256 p ref
(Contract F08635-73-C-0041; AF Proj. 670D)
(AD-775357; AFATL-TR-73-120) Avail: NTIS CSCL 16/4

The report documents a study which updates the aerodynamic configuration, subsystem design characteristics, and interface definition of a modular family of air-to-surface weapons which were defined in a preceding study. The revised Modular Weapon System (MWS) family makes use of existing production and development hardware including a series of terminal guidance modules which are also fully compatible with the modular Maverick family. Other modules employed in the family include the Aimpoint and/or Pave Storm 3 optical correlation guidance, the SUU-54, MK84 and HSM warheads, plus a modified Thiokol TU-686 rocket motor for propulsion. The design optimization and interface definition was optimized for a direct attack mode having standoff ranges up to 20 nautical miles. (Modified author abstract) GRA

N74-22516# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Materials Directorate.
MODAL RESPONSE OF FREE ROCKETS UNDER THRUST LOADING
H. B. Wilson and J. J. Richardson 14 Jan. 1974 64 p
(DA Proj. 1M3-62303-A-214)
(AD-775377; RL-TR-74-2) Avail: NTIS CSCL 19/7

In the report an analysis yielding the modal responses of a rocket, constrained or in free flight, is presented. The effects of a tangential end thrust are considered as are the influences of shear and structural joints. The modelling was accomplished by employing the finite element technique. The resulting program, called Vibration Analysis of an Axially Loaded Rocket (VAALR), is discussed and a section on user procedures is included. Examples are offered to aid the engineer in data card preparation. The results of parameter studies are considered to offer some suggestions in modelling. Among the parameter studies is an analysis of the THAD T-6 missile. Author (GRA)

N74-22517# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DESIGN OF AN AUTONOMOUS STATIONKEEPING CONTROLLER FOR LES-8/9
Sushanta Srivastava and Roger W. Brockett 21 Feb. 1974 64 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-775144; TN-1974-1; ESD-TR-74-39) Avail: NTIS CSCL 22/3

The report describes the design of the controller and digital filter for the LES-8/9 autonomous stationkeeping system. The design goals are to maintain a station with plus or minus 0.15 deg. accuracy with an efficient thruster fuel usage and execute automatic station changes when necessary at a controlled coasting speed. These goals are accomplished by using a time-varying eighth-and sixteenth-order filter, and a non-linear controller with switching zones. The final design is optimized taking into account stochastic nature of the navigation error. The controller parameters and filters can be altered in orbit to achieve the optimum performance for the navigation error seen in orbit. Author (GRA)

N74-22518# Braddock, Dunn and McDonald, Inc., Albuquerque, N.Mex.
TACOS 11.7 RADAR TRAINABILITY AND SEPARATE MISSILE LAUNCHER SUBMODELS Final Report
J. N. Gant, S. H. Garrison, and J. J. Sikora 31 Dec. 1973 470 p refs
(Contract DAEA18-72-A-0192)
(AD-774812; BDM/A-10-74-TR) Avail: NTIS CSCL 15/3

The report describes the trainability and separate missile launcher submodels developed and implemented in the TACOS 2 model. GRA

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-22519 Engineering Sciences Data Unit, London (England).
BUCKLING OF FLAT PLATES IN SHEAR
Feb. 1971 2 p refs
(ESDU-71005) Copyright. Avail: Issuing Activity

The buckling stress of flat isotropic plates loaded in uniform shear is determined by plotting the elastic buckling stress coefficients against the width and length of the plate for six combinations of supported and clamped edges. An example calculation determines the shear stress at which a rectangular plate buckles. G.G.

N74-22520 Engineering Sciences Data Unit, London (England).
SANDWICH PANELS WITH CORRUGATED CORE AND EQUAL FACE PLATES TRANSVERSE SHEAR STIFFNESS
Apr. 1974 2 p refs
(ESDU-07.03.01-Amend-A) Copyright. Avail: Issuing Activity

It is shown that the shear stiffness factor of a corrugated panel depends on the nature of core attachment to the face plates, whether by adhesive, rivets or spot welds. An example calculation for a line weld attachment is included. G.G.

N74-22521 Engineering Sciences Data Unit, London (England).
ESTIMATION OF THE INITIAL BUCKLING STRESS UDNER UNIAXIAL COMPRESSION OF A SKIN WITH INTEGRAL UNFLANGED STIFFENERS
Mar. 1974 3 p
(ESDU-02-01.34-Amend-A-B) Copyright. Avail: Issuing Activity

A method for estimating the initial buckling stress of metal skin structures is presented. The skin consists of isotropic materials with integral unflanged stiffeners. A mathematical model is presented to show the relationships of the variable quantitites. The computation of the initial buckling stress, appropriate to the mode of deformation involving distortion of the cross section without translation of the component flats, consists of a search for the minimum value of the longitudinal compressive stress associated with a zero value of the total stiffness. Author

N74-22522 Engineering Sciences Data Unit, London (England).
ESTIMATION OF THE INITIAL BUCKLING STRESS UNDER UNIAXIAL COMPRESSION OF A SKIN WITH Z-SECTION STRINGERS
Mar. 1974 3 p
(ESDU-02.01.35-Amend-A-B) Copyright. Avail: Issuing Activity

A method for estimating the initial buckling stress under uniaxial compression of a skin with Z-section stringers is developed. The skin is manufactured from isotropic material. A diagram of a typical cross section and the computation of the buckling stress are given. The computation of the stress consists of a search for the minimum value of the longitudinal compressive stress associated with a zero value of the total stiffness. Author

N74-22523 Engineering Sciences Data Unit, London (England).
ESTIMATION OF THE INITIAL BUCKLING STRESS UNDER UNIAXIAL COMPRESSION OF A SKIN WITH TOP HAT SECTION STRINGERS

Mar. 1974 3 p
(ESDU-02.01.36-Amend-A-B) Copyright. Avail: Issuing Activity

The estimation of the initial buckling stress under uniaxial compression of a skin with top hat section stringers manufactured from an isotropic material is computed. A diagram of a typical cross section of this type is given. Explanatory notes on this computation are given below. The computation of the initial buckling stress, appropriate to a mode of deformation involving distortion of the cross section without translation of any of the junctions of the component flats, consists of a search for the minimum value of the longitudinal compressive stress associated with a zero value of the total stiffness. Author

N74-22524 Engineering Sciences Data Unit, London (England).
ESTIMATION OF THE INITIAL BUCKLING STRESS UNDER UNIAXIAL COMPRESSION OF A CORRUGATED SANDWICH PANEL
Mar. 1974 3 p
(ESDU-02.01.37) Copyright. Avail: Issuing Activity

A method for determining the initial buckling stress under uniaxial compression of corrugated sandwich panels is presented. The panels are made of an isotropic material. A diagram of the cross section and the computation of the buckling stress are shown. The computation of the initial buckling stress consists of a search for the minimum value of the longitudinal stress associated with a zero value of the total stiffness. Author

N74-22525 Engineering Sciences Data Unit, London (England).
FLEXIBLE CIRCULAR FRAMES SUPPORTING A SHELL DISPLACEMENTS DUE TO CONCENTRATED LOADS AND COUPLES
Apr. 1974 13 p ref
(ESDU-03.06.15-Amend-A) Copyright. Avail: Issuing Activity

Curves are presented which show the radial, angular and tangential displacements of flexible circular frames supporting shells, due to concentrated couples, concentrated tangential loads and concentrated radial loads. Author

N74-22526 Engineering Sciences Data Unit, London (England).
BUCKLING OF LONG FLAT ORTHOTROPIC PLATES IN SHEAR
Feb. 1974 8 p ref Sponsored by Roy. Aeron. Soc.
(ESDU-74005) Copyright. Avail: Issuing Activity

A matrix method is used to calculate the buckling load intensity under in-plane shear of isotropic or orthotropic plates the edges of which are elastically restrained against rotation. Shear load carrying flat plates made from laminated composite materials are considered. G.G.

N74-22527 Stuttgart Univ. (West Germany). Inst. fuer Umformtechnik.
DEFORMATION AND STRAIN CONDITION OF BIG IRREGULAR SHEETS DURING DRAWING [UEBER DEN FORMAENDERUNGS- UND SPANNUNGSZUSTAND BEIM ZIEHEN VON GROSSEN UNREGELMAESSIGEN BLECHTEILEN]
Vladimir Hasek Essen Verlag W. Girardet Sep. 1973 237 p refs In GERMAN Sponsored by Deut. Forschungsges. fuer Blechverarbeitung und Oberflaechenbehandlung
(Rept-25) Copyright. Avail: Verlag W. Girardet, Essen

The deformation of metal sheets as a result of drawing was established using line networks printed on the sheets. The results give an adequate representation of stress and flow during deformation. Plastic instabilities such as flowing and bending are discussed. Cracking was investigated using forming limit diagrams. For carrying out the drawing experiments, a universal apparatus was developed which is described in detail. ESRO

N74-22528*# General Dynamics/Convair, San Diego, Calif.
CONICAL ISOGRID ADAPTER STRUCTURAL TEST RESULTS
Jack E. Dyer and P. Slysh Feb. 1974 211 p refs
(Contract NAS8-29859)
(NASA-CR-120205; PD-73-0123) Avail: NTIS HC$13.75 CSCL 20K

The structural characteristics of isogrid composite structures are discussed. To demonstrate the feasibility of applying isogrid to conical structures, a full scale flanged isogrid conical adapter similar to the configuration of the D-1 Centaur equipment module was constructed. The adapter was tested to evaluate the response of the conical isogrid structure to various combinations of bending and axial compression loading. The analysis techniques for predicting conical isogrid structural capability are examined. Author

N74-22529*# Princeton Univ., N.J. Dept. of Chemical Engineering.
ADVANCE DEVELOPMENT OF A TECHNIQUE FOR CHARACTERIZING THE THERMOMECHANICAL PROPERTIES OF THERMALLY STABLE POLYMERS Final Report
J. K. Gillham, S. J. Stadnicki, and Y. Hazony Jan. 1974 24 p refs Submitted for publication
(Grant NGR-31-001-200)
(NASA-CR-138123) Avail: NTIS HC $4.25 CSCL 20K

The torsional braid experiment has been interfaced with a centralized hierarchical computing system for data acquisition and data processing. Such a system, when matched by the appropriate upgrading of the monitoring techniques, provides high resolution thermomechanical spectra of rigidity and damping, and their derivatives with respect to temperature. Author

N74-22530*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DETERMINATION OF MECHANICAL PROPERTIES OF EXCISED DOG RADII FROM LATERAL VIBRATION EXPERIMENTS
Gerald A. Thompson, Max Anliker, and Donald R. Young [1973] 22 p refs Prepared in cooperation with Stanford Univ.
(Grants NGL-05-020-223; GM-43015)
(NASA-TM-X-70037) Avail: NTIS HC $4.25 CSCL 20K

Experimental data which can be used as a guideline in developing a mathematical model for lateral vibrations of whole bone are reported. The study used wet and dry dog radii mounted in a cantilever configuration. Data are also given on the mechanical, geometric, and viscoelastic properties of bones. Author

N74-22531*# Youngstown State Univ., Ohio.
APPLICATION OF ULTRASONIC SIGNATURE ANALYSIS FOR FATIGUE DETECTION IN COMPLEX STRUCTURES Final Report, 1 Sep. 1972 - 30 Nov. 1973
Allan Joseph Zuckerwar 28 Feb. 1974 80 p refs
(Grant NGR-36-028-006)
(NASA-CR-138113) Avail: NTIS HC $7.00 CSCL 20K

Ultrasonic signature analysis shows promise of being a singularly well-suited method for detecting fatigue in structures as complex as aircraft. The method employs instrumentation centered about a Fourier analyzer system, which features analog-to-digital conversion, digital data processing, and digital display of cross-correlation functions and cross-spectra. These features are essential to the analysis of ultrasonic signatures according to the procedure described here. In order to establish the feasibility of the method, the initial experiments were confined to simple plates with simulated and fatigue-induced defects respectively. In the first test the signature proved sensitive to the size of a small hole drilled into the plate. In the second test, performed on a series of fatigue-loaded plates, the signature proved capable of indicating both the initial appearance and subsequent growth of a fatigue crack. In view of these encouraging results it is concluded that the method has reached a sufficiently advanced stage of development to warrant application to small-scale structures or even actual aircraft. Author

N74-22532*# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
FAILURE CRITERIA FOR VISCOELASTIC MATERIALS Final Report
W. G. Knauss Jan. 1974 328 p refs
(Grant NGL-05-002-005)
(NASA-CR-138125; GALCIT-120) Avail: NTIS HC $19.50 CSCL 20K

Research projects concerned with developing a theory of fracture of materials are discussed. The effects of the geometry

of the structure and the loads acting on the structure as they influence the failure process are analyzed. The effects of the viscoelastic deformation characteristics of the bulk elastomer on failure behavior are examined. Additional material parameters which control the fracture process are identified. Author

N74-22533*# California Univ., Livermore. Lawrence Livermore Lab.
FILAMENT-WOUND KEVLAR 49/EPOXY PRESSURE VESSELS
T. T. Chiao, M. A. Hamstad, M. A. Marcon, and J. E. Hanafee 9 Nov. 1973 66 p refs
(NASA Order C-13980-C; Contract W-7405-eng-48)
(NASA-CR-134506; UCRL-51466) Avail: NTIS HC $6.50 CSCL 20K

The performance of an organic fiber (Kevlar 49) has been investigated. A detailed study of the strength of fiber/epoxy strands was completed. Variables studied included: (1) fiber uniformity, (2) strength distribution at room and LN2 temperatures (3) stress-strain characteristics, (4) strain rate effect on the fiber strength, (5) stress-rupture behavior, and (6) aging under no load. The composite performance in filament-wound pressure vessels was studied. Variables studied included: (1) spherical vs cylindrical vessels, (2) cylindrical vessel design and size, (3) winding patterns, (4) reproducibility, (5) pressurization rate, (6) fatigue, and (7) effect of liquid hydrogen temperatures. A study was made of the acoustic emission generated during tensile tests of the fiber/epoxy strands, tensile tests of fiber/epoxy elongated NOL rings, burst tests at room temperature of the cylindrical and spherical pressure vessels, and vessel fatigue tests. A microstructural characterization of the failure mode of the fiber was carried out using transmission and scanning electron microscopy and optical microscopy. Fracture surfaces of bare fibers were compared with epoxy impregnated strands from tensile tests, pressure vessels, and NOL rings. Author

N74-22534*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLUTTER OF ELASTICALLY SUPPORTED ORTHOTROPIC PANELS INCLUDING THE EFFECTS OF FLOW ANGLE
James Wayne Sawyer Washington May 1974 38 p refs
(NASA-TN-D-7491; L-9312) Avail: NTIS HC $3.25 CSCL 20K

A theoretical panel flutter analysis and computer program was developed which is capable of analyzing an orthotropic panel with in-plane loads, at various angles of cross flow and various edge-support conditions. The resulting modal analysis uses linear piston-theory aerodynamics and includes both aerodynamic and structural damping. Calculations made for typical panels with no in-plane forces show that large reductions in dynamic presure for flutter are possible with only small changes in flow angle. The reduction in dynamic pressure with flow angle is greater for elastically supported panels than for simply supported panels. Aerodynamic damping has a significant stabilizing effect at all flow angles except zero, whereas structural damping has negligible effect. Author

N74-22535*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECT OF BROKEN STRINGERS ON THE STRESS INTENSITY FACTOR FOR A UNIFORMLY STIFFENED SHEET CONTAINING A CRACK
Clarence C. Poe, Jr. 1973 13 p refs Presented at the 10th Anniv. Meeting of the Soc. of Eng. Sci., Raleigh, N. C., 5-7 Nov. 1973
(NASA-TM-X-71947) Avail: NTIS HC $4.00 CSCL 20K

A linear elastic stress analysis was made of a centrally cracked sheet stiffened by riveted, uniformly spaced and sized stringers. The stress intensity factor for the sheet and the load concentration factor for the most highly loaded stringer were determined for various numbers of broken stringers. A broken stringer causes the stress intensity factor to be very high when the crack tip is near the broken stringer, but causes little effect when the crack tip extends beyond several intact stringers. A broken stringer also causes an increase in the load concentration factor of the adjacent stringers. The calculated residual strengths and fatigue-crack-growth lives of a stiffened aluminum sheet with a broken stringer were only slightly less than a sheet with all intact stringers, and were still much higher than those of an unstiffened sheet. Author

N74-22536# Aeronautical Research Labs., Melbourne (Australia).
ANALYSIS OF AN ORTHOTROPIC PLATE WITH TWO OPPOSITE EDGES SIMPLY SUPPORTED AND THE OTHER TWO FREE
R. H. Keays Sep. 1973 24 p refs
(ARL/SM-Note-398) Avail: NTIS HC $4.25

The results of three different analyses of an orthotropic plate simply-supported at the ends and free on the other two sides are compared. The particular plate analysed had a length to width ratio of 8:1 and a ratio of longitudinal modulus to transverse modulus of 6.67:1. The simplest method of analysis is beam theory which gives longitudinal stresses with sufficient accuracy. More useful, however, is an analytic solution based on application of the theory of thin plates in bending. This gives values for transverse and twisting moments which quantities are assumed zero in the beam theory analysis. For comparison the same problem was analysed using NASTRAN. This produces values of bending and twisting moments in general agreement with the thin plate theory values. However, in the region of the corner, where thin plate theory assumes a concentrated tie-down force, the finite element analysis did produce what appeared at first sight to be spurious results. Also it appears there may be a fault in the stress recovery in NASTRAN for the transverse shear force. The analysis is confined to a single load-case (four-point bending) but can be easily extended to other loadings. Author

N74-22537# Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
NOTCH SENSITIVITY AND FATIGUE STRENGTH OF AIRCRAFT SHEET MATERIAL SPECIMENS
Alfred Buch [1974] 35 p refs
(TAE-184) Avail: NTIS HC $4.75

Fatigue tests in tension compression and pulsating tension on internally notched sheet specimens were performed for comparison of the notch factor KF and notch sensitivity index KF/KT for sheet materials 6061-T4, 2024-T3 and 7075-T6 with and without cladding. The fatigue limits of unnotched and notched specimens were higher for bar specimens 7075-T6 and 2024-T3 compared with corresponding Alclad specimens. The fatigue limit values of 6061-T4 were similar to the corresponding values for 2024-T3-Alclad. The ratios KF/KT for all investigated materials increased with the notch radius r. This permitted an analytical and graphical formulation of the notch sensitivity functions KF/KT = f(r) for the investigated Al-alloys. Author

N74-22538# Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
OPTIMAL PLASTIC DESIGN OF DOUBLY SYMMETRIC CLOSED STRUCTURES
S. C. Batterman (Penn. Univ.) and L. P. Felton (Calif. Univ., Los Angeles) May 1971 35 p refs
(TAE-126) Avail: NTIS HC $4.75

Optimal plastic design of doubly symmetric closed ring and frame structures of idealized sandwich section is formulated utilizing the Marcal-Prager optimization method. Detailed results are presented for elliptical rings and rectangular frames under uniform internal pressure. As the design load increases, the elliptical ring requires consideration of two optimal design configurations while the rectangular frame requires considering eight distinct possible design configurations. Curves of total cost as a function of design load are presented and results for pure bending are obtained as special cases. Author

N74-22539# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
FATIGUE DAMAGE CUMULATION FOR ROUND STEEL SPECIMENS WITH TRANSVERSE HOLES (K SUB T EQUALS 2) IN COMPARISON WITH DAMAGE CUMULATION FOR OTHER SPECIMEN TYPES
A. Buch and F. Weinstein Oct. 1972 52 p refs
(TAE-164) Avail: NTIS HC $5.75

Fatigue damage cumulation of low-carbon steel specimens with transverse hole (K sub T = 2.04) were investigated in

two-step rotating-bending tests with H-L, L-H and block loading sequence. Both amplitude levels of sigma sub 1 and sigma sub 2 were much higher than the fatigue limit level and the difference sigma sub 1 - sigma sub 2 was not large. Various initial stress cycle ratios in two-step tests or various cycle ratios, in block tests were used. The tests show that cycle ratio sums 7 sigma n/N(min) were always greater than 1. In the case when the second or the third step was at the fatigue limit level sigma n/N sub(min) were mostly lower than 1 but sigma n/N sub F greater than or equal to 1 at failure. Author

N74-22540# Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
FINITE LONGITUDINALLY MULTI-LAYERED MEMBRANE SHELLS SUBJECTED TO IMPACT LOADS
M. Ziv Sep. 1973 122 p refs In ENGLISH; partly in HEBREW
(TAE-186) Avail: NTIS HC $9.25

The transient response of a finite longitudinally multilayered cylindrical membrane shell impacted by longitudinal axisymmetric loads is obtained. Membrane stress distribution and particles' velocities are determined for the entire solution domain. The method of solution consists of characteristics finite difference technique and discontinuity relations. A characteristics finite difference integration scheme is constructed for regions where the variables are continuous. Discontinuity relations are developed to encounter the impulsive leading wave and its reflection and refraction at the interfaces. An example problem which demonstrates the method is solved. The present generalized analysis is valid for any number of layers, unrestricted to length or material properties. Author

N74-22541*# Materials Sciences Corp., Blue Bell, Pa.
NON-LINEAR BEHAVIOR OF FIBER COMPOSITE LAMINATES
Zvi Hashin, Debal Bagchi, and B. Walter Rosen Washington Apr. 1974 130 p refs
(Contract NAS1-11284)
(NASA-CR-2313; TFR/7309) Avail: NTIS HC $4.75 CSCL 20K

The non-linear behavior of fiber composite laminates which results from lamina non-linear characteristics was examined. The analysis uses a Ramberg-Osgood representation of the lamina transverse and shear stress strain curves in conjunction with deformation theory to describe the resultant laminate non-linear behavior. A laminate having an arbitrary number of oriented layers and subjected to a general state of membrane stress was treated. Parametric results and comparison with experimental data and prior theoretical results are presented. Author

N74-22542# Joint Publications Research Service, Arlington, Va.
NEW MATERIALS IN ENGINEERING
I. Popov and V. Sviridov 6 May 1974 51 p Transl. into ENGLISH of the book "Novyye Materialy v Tekhnike" Moscow, Izdatelstvo Znaniye, 25 Sep. 1973 64 p
(JPRS-61919) Avail: NTIS HC $5.75

The production and characteristics of construction materials for aerospace applications are discussed. The materials considered are: (1) construction steel, (2) heat resistant and stainless steels, (3) aluminum and aluminum alloys, (4) powder metallurgy, (5) composite materials, and (6) polymer materials and plastics. Author

N74-22543# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
MAIN EFFORTS IN FATIGUE RESEARCH AT THE LABORATORIUM FUER BETRIEBSFESTIGKEITSFORSCHUNG [SCHWERPUNKTE DER BETRIEBSFESTIGKEITSFORSCHUNG IM LBF]
Otto Buxbaum, ed. 6 Nov. 1973 109 p ref In GERMAN Proc. of 2d LBF Colloq., Darmstadt, West Ger., 1-2 Nov. 1973
(LBF-TB-110/73) Avail: NTIS HC $8.50

Analysis of operational stresses by means of a digital computer, multi-axial fatigue loading, random testing, elastic-plastic behaviour in notches, fatigue strength criteria of welded joints, and aspects of safety taking into account the scatter of materials under fatigue loading are presented. For individual titles, see N74-22544 through N74-22550.

N74-22544 Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
MAIN EFFORTS IN FATIGUE RESEARCH AT THE LABORATORIUM FUER BETRIEBSFESTIGKEIT [SCHWERPUNKTE DER BETRIEBSFESTIGKEITSFORSCHUNG IM LBF]
Otto Buxbaum *In its* Main Efforts in Fatigue Res. at the LBF 6 Nov. 1973 p 7-22 In GERMAN (For availability see N74-22543 13-32)

The main efforts in fatigue research at LBF are discussed. These include experimental and computational determination of stresses of structural members, analysis of these stresses and prediction from measured data of the stresses to be expected during utilization of a structural member, and derivation of relationships between local stresses and outside forces. ESRO

N74-22545 Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
ANALYSIS OF STRESS-TIME-FUNCTIONS USING A DIGITAL COMPUTER [DIE ANALYSE VON BEANSPRUCHUNGSZEITFUNKTIONEN MIT HILFE EINES DIGITALRECHNERS]
J. M. Zaschel *In its* Main Efforts in Fatigue Res. at the LBF 6 Nov. 1973 p 23-35 In GERMAN (For availability see N74-22543 13-32)

The computerized stress-time function analysis system developed at the Laboratorium fuer Betriebsfestigkeit, Darmstadt, Germany, is discussed. Design considerations include universal applicability, economy, and possibility for the engineer to evaluate intermediate results and make decisions on the further course of the analysis. The advantages and disadvantages of the system are also discussed and improvements are outlined. ESRO

N74-22546 Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
DETERMINATION OF STRESS OF MATERIALS DURING MULTIAXIAL CYCLIC STRESSES [ERMITTLUNG DER WERKSTOFFANSTRENGUNG BEI MEHRACHSIGER SCHWINGBEANSPRUCHUNG]
V. Grubisic and A. Simbuerger *In its* Main Efforts in Fatigue Res. at the LBF 6 Nov. 1973 p 37-49 ref In GERMAN (For availability see N74-22543 13-32)

Procedures for determining multiaxial cyclic stresses in structural members are discussed, notably the bearing wall of a crank casing of a V-motor and the hollow chain in a crankshaft. Only sine stresses of equal frequency, with or without time phase shift, were considered. ESRO

N74-22547 Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
INFLUENCE OF THE IRREGULARITY FACTOR ON THE LIFETIME [EINFLUSS DES UNREGELMAESSIGKEITSFAKTORS AUF DIE LEBENSDAUER]
H. Lowak and E. Gassner *In its* Main Efforts in Fatigue Res. at the LBF 6 Nov. 1973 p 51-60 In GERMAN (For availability see N74-22543 13-32)

A simulation technique was used to determine the influence of irregularity factors on structural member lifetime. The technique was tested on axially stressed notched bars. Results of the tests show that an irregularity factor between 0.7 and 0.99 may be recommended. ESRO

N74-22548 Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
PROBLEM OF ESTIMATING LIFETIME BY MEANS OF ELASTIC PLASTIC BEHAVIOR OF NOTCHED MATERIAL [ZUR PROBLEMATIK DER LEBENSDAUERABSCHAETZUNG MIT HILFE DES ELASTISCH PLASTISCHEN KERBGRUNDVERHALTENS]
D. Schuetz, H. Lowak, and J. J. Gerharz *In its* Main Efforts in Fatigue Res. at the LBF 6 Nov. 1973 p 61-76 In GERMAN (For availability see N74-22543 13-32)

The companion specimen method was used to determine the stress of notched AlCuMg2 bars. In addition, single step damage accumulation tests were carried out. The values measured

were evaluated, and the reliability of the lifetime prediction derived from these values was assessed. ESRO

N74-22549 Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
SYSTEMATIC INVESTIGATIONS OF CYCLIC STRESSES ON WELDED JOINTS IN ORDER TO DERIVE EUROPEAN MEASURING STANDARDS [SYSTEMATISCHE UNTERSUCHUNGEN SCHWINGBEANSPRUCHTER SCHWEISSVERBINDUNGEN ZUR AUFSTELLUNG EUROPAEISCHER BEMESSUNGSRICHTLINIEN]
R. Olivier *In its* Main Efforts in Fatigue Res. at the LBF 6 Nov. 1973 p 77-94 In GERMAN (For availability see N74-22543 13-32)

A European norm for the measurement of maximum allowable cyclic stresses in welded steel joints is described. Seven laboratories in five countries were involved. The steels ST52 (Euronorm Fe E36-03) and Fe E47 were used for this project. ESRO

N74-22550 Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
CYCLIC STRESSED MATERIAL SAFETY PREDICTION WITH ALLOWANCE FOR SPREAD IN LIFETIME [AUSSAGEN ZUR SCHWINGBRUCHSICHERHEIT UNTER ANSATZ DER LEBENSDAUERSTREUUNG]
E. Haibach and H. P. Lehrke *In its* Main Efforts in Fatigue Res. at the LBF 6 Nov. 1973 p 95-109 In GERMAN (For availability see N74-22543 13-32)

Cyclic load life tests on welded joints were carried out. The results were statistically analyzed in order to make predictions on the safeness of cyclic loaded structural members. ESRO

N74-22551# Royal Aircraft Establishment, Farnborough (England).
SOME VIBRATIONAL CHARACTERISTICS OF A COMBINED COLUMN-BEAM-MASS SYSTEM
D. McK. Ridland Sep. 1973 85 p refs
(RAE-TR-73099; BR36778) Avail: NTIS HC $7.25

The vibrational characteristics of a cantilever beam with a concentrated mass at one end and with the other end rigidly attached to the top of a vertical column are discussed. The bottom end of the column was fixed. The transverse bending of the beam in the horizontal plane was coupled with the torsional vibration of the column. This model was taken as a simple representation of a cockpit motion machine, in order to learn something of the vibrational characteristics of the machine. The equations of motion were derived separately for the torsional vibration of a fixed-free column and for the transverse vibration of a fixed-free beam, with and without a concentrated mass. The frequency equation for the combined column-beam-mass system was then obtained. Consideration was given to the Rayleigh-Ritz method and the choice of suitable functions to represent deflections for the column-beam-mass system. The method is used to determine the effect of varying the stiffness of the beam without a concentrated mass, the effect of mass variation for three beam stiffness, and finally, frequencies and eigenvectors for the representative cockpit motion machine. (ESRO)

N74-22552# European Space Research Organization, Paris (France).
BUCKLING LOADS OF SHEET METAL SILOS WITH OVERLAPPING CIRCUMFERENTIAL SEAMS
M. Esslinger (DFVLR, Brunswick) Mar. 1974 27 p refs Transl. into ENGLISH of Beullasten von Stahlsilos mit Ueberlappten Rundnaehten, DLR-FB-73-36, DFVLR, 22 Jan. 1973
(ESRO-TT-33; DLR-FB-73-36) Avail: NTIS HC $4.50; Original report in GERMAN: DFVLR, Porz, West Ger. 9 DM

A numerical method for calculating the buckling loads of cylindrical silos constructed of overlapping ring segments is presented. The application of the method is demonstrated by an example. The numerical results are discussed. Author (ESRO)

N74-22553# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE DEFORMATION OF A SLOPING SPHERE UNDER IMPULSIVE LOADING ACCORDING TO THE THREE DIMENSIONAL THEORY OF ELASTICITY AND THE THEORY OF SHELLS
E. M. Shipitsina 14 Jan. 1974 12 p refs Transl. into ENGLISH from Prikl. Mekh. (Ukraina SSR), v. 8, no. 11, 1972 p 28-32
(AD-774409; FTD-HT-23-794-74) Avail: NTIS CSCL 20/11

A hollow sphere under uniform impulsive loading is examined. By integrating the basic system of equations (equations of motion, boundary and initial conditions), the deformation of the shell is determined. It is concluded that the deformation is determined by the size of the pulse. F.O.S.

N74-22554# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
APPLICATION OF THE STRAIN-ENERGY-DENSITY THEORY TO FUNDAMENTAL FRACTURE PROBLEMS
G. C. Sih Nov. 1973 20 p refs Presented at the Anniv. Meeting of the Soc. of Eng. Sci. (10th), Raleigh, N. C., Nov. 1973
(Grant AF-AFOSR-2586-74; AF Proj. 6813)
(AD-775089; IFSM-73-49; AFOSR-74-0188TR) Avail: NTIS CSCL 20/12

The present study attempts to describe some essential features of the fracture problem associated with the analytical modeling of a crack. The topics chosen for this investigation are: (1) slanted crack, (2) crack tip notch effect, (3) material nonhomogeneity, and (4) fracture in three dimensions. A brief discussion is also given to crack propagation in the presence of plastic deformation. All the analyses are based on the strain-energy-density factor, S, concept which assumes fracture to occur in an element ahead of the crack when S reaches its critical value, Sc. Author (GRA)

N74-22555# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NUMERICAL EXECUTION OF THE BUBNOV-GALERKIN METHOD ON AN ELECTRONIC COMPUTER WITH THE SOLUTION OF NONLINEAR PROBLEMS OF THE THEORY OF SLOPING SHELLS
N. I. Dedov and N. N. Stolyarov 31 Jan. 1974 15 p refs Transl. into ENGLISH from Issled. po Teorii Plastin Obolochek (USSR), no. 9, 1972 p 196-204
(AD-775130; FTD-HT-23-345-74) Avail: NTIS CSCL 20/11

A series of nonlinear problems of the theory of sloping shells on a rectangular plane have been solved on an electronic computer by the Bubnov-Galerkin method. A single program was set up, making it possible to calculate flexible shells under various boundary conditions and various transverse loads. The program provides for the numerical execution of all stages of the Bubnov-Galerkin method. The results of the solution are presented in tables and graphs. Values have been established for the parameters of curvature with which the phenomenon of shell snapping occurs. The values of the parameters of critical load and the parameters of bending are found for various curvatures. Author

N74-22556# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DIFFERENTIAL EQUATIONS OF THE THERMOELASTIC STATE OF SHELLS DURING THERMAL SHOCK ALONG A SURFACE
E. A. Gotsulyak, V. I. Gulyayev, and V. K. Chibiryakov 4 Feb. 1974 17 p refs Transl. into ENGLISH from Prikl. Mekh. (USSR), v. 9, no. 2, 1973 p 32-41
(AD-775133; FTD-HT-23-796-74) Avail: NTIS CSCL 20/11

The projection method (method of moments) is used to obtain differential equations of motion for a shell under conditions of rapid temperature change. The method reduces the three-dimensional problem of the thermoelastic dynamics of a shell to a two-dimensional problem. Author

N74-22557# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ST. VENANT PROBLEM FOR A CONTINUOUS NONUNIFORM ANISOTROPIC BEAM
S. G. Lekhnitskiy 31 Jan. 1974 16 p refs Transl. into ENGLISH from Mekhan. Sploshnoi Sredy i Rodstvennye Probl. Analiza (Leningrad), 1972 p 273-279
(AD-775135; FTD-HT-23-339-74) Avail: NTIS CSCL 20/11

The St. Venant problem for a uniform isotropic prismatic or cylindrical beam is one of the most simple problems in the classical linear theory of elasticity. However, it can be considerably complicated if the body is not uniform and isotropic, i.e., its elastic properties are different at various points and in various directions. Without considering the problem in all its generality, the author studies the case of an orthotropic beam, i.e., a beam which has at every point three orthogonal and respectively parallel planes of elastic symmetry, with absolute values and coefficients of elasticity assigned as continuous functions of two coordinates having derivatives to the second order inclusively. GRA

N74-22558# Army Missile Command, Redstone Arsenal, Ala.
VIBRATION ABSORBERS FOR ROCKET LAUNCHERS MOUNTED ON HELICOPTERS: ANALYTICAL ANALYSIS AND IMPLEMENTATION TECHNIQUES
C. D. Johnson 2 Jan. 1974 87 p refs
(DA Proj. 1M3-62303-A-214)
(AD-774845; RL-TR-74-1) Avail: NTIS CSCL 19/7

An analytical analysis of the dynamical behavior of the tuned-mass vibration absorber is presented, and the notion of optimum damping is introduced. Computational techniques for calculating optimum damping coefficients are developed and three representative numerical examples are solved. A nonlinear servo-control system is designed to achieve inflight automatic tuning of the tuned-mass absorber in the face of varying helicopter rotor speeds. The practical aspects of implementing active vibration absorbers are studied and some specific circuits and hardware schemes are proposed. A spring-linkage (parallelogram) mount, a cantilever-wing tuned-mass absorber, and an active absorber are designed for implementation and testing on a full scale mock-up of a Cobra helicopter wing. (Modified author abstract) GRA

N74-22559# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A CONICAL SHELL OF LINEARLY VARIABLE THICKNESS UNDER THE EFFECT OF A NORMAL CONCENTRATED FORCE
N. G. Guryanov and Yu. P. Artyuhkin 31 Jan. 1974 19 p refs Transl. into ENGLISH from Issled. po Teorii Plastin Obolochek (USSR), no. 8, 1972 p 278-286
(AD-775115; FTD-HT-23-361-74) Avail: NTIS CSCL 20/11

A nonsloping conical shell whose thickness varies linearly is examined. The shell is loaded by a normal concentrated force applied at point M(r', phi'). The initial system of equations reduces to two equations with constant coefficients. The equations are integrated using double trigonometric series which approximately correspond to the case of a freely supported shell. GRA

N74-22560# Duke Univ., Durham, N.C. Dept. of Civil Engineering.
ELAS65 COMPUTER PROGRAM FOR EQUILIBRIUM PROBLEMS OF ELASTIC-THERMOPLASTIC SOLIDS AND STRUCTURES Interim Technical Report
S. Utku, M. S. M. Rao, and G. J. Dvorak Nov. 1973 82 p refs
(Grant DA-ARO(D)-31-124-71-G103)
(AD-775536; Ser-15A; AROD-9570-2-E; ITR-2) Avail: NTIS CSCL 20/11

A general purpose digital computer program, named ELAS65, for the in-core solution of the nonlinear equilibrium problems of solids and structures is described. This report contains the instructions for the user, the basic documentation of the program, and the theoretical background information, together with sample input/output. Author (GRA)

N74-22561# Army Materials and Mechanics Research Center, Watertown, Mass.
LINEAR STABILITY OF ECCENTRICALLY STIFFENED CYLINDRICAL SHELL UNDERAXIAL COMPRESSION
Tien Yu Tsui and Chatta Lakshmikantham Dec. 1973 33 p
(DA Proj. 1T1-61102-B-33A)
(AD-775445; AMMRC-TR-73-58) Avail: NTIS CSCL 20/11

Linear stability of eccentrically stiffened cylindrical shells under axial compression has been investigated in the paper with an aim to establish the parameter ranges for the prevailing buckling modes. Charts delineating the zones of prevailing modes are presented in a parameter plane. Useful approximate relations are given for the bounds on parameters to predict a buckling mode for a shell in the moderate length range. Author (GRA)

N74-22562# Naval Ordnance Lab., White Oak, Md.
AXISYMMETRIC ELASTIC DEFORMATIONS AND STRESSES IN ORTHOTROPIC SANDWICH CYLINDERS UNDER UNIFORM EXTERNAL HYDROSTATIC PRESSURE Final Report
M. B. Moore, III 14 Nov. 1973 29 p refs
(AD-774910; NOLTR-73-168) Avail: NTIS CSCL 19/8

Equations describing the stresses in orthotropic sandwich cylinders under hydrostatic pressure are derived. These equations are used to plot design curves for these cylinders in a range of diameters from 13 inches to 25 inches and up to an applied pressure of 10,000 psi. Double wall composite sandwich cylinders are compared to cellular sandwich shells fabricated from aluminum and to conventional rib-stiffened cylinders. Finally, sandwich cylinders fabricated with S glass facings and graphite facings are compared. Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-22563 Ernst-Mach-Inst., Freiburg (West Germany).
DETONATION AND DEFLAGRATION IN EXPLOSIVE GAS MIXTURES [DETONATION UND DEFLAGRATION IN EXPLOSIBLEN GASGEMISCHEN]
J. H. Schaefer 1972 46 p refs In GERMAN; ENGLISH summary
(Rept-3/73) Avail: Issuing Activity

A calculating program was set up to permit estimation of the detonation and deflagration velocity of functions of state, as well as of concentration of the different components of the burned gas. The steady one-dimensional ZELDOVICH model was taken as a basis. The consideration of the equilibrium constant of the fuel gases and the calculation of the deflagration is new. It is shown that the equilibrium of the fuel gases is of no important influence. That means that the dissociation of the combustion products has a decisive influence on the effective heat change. Author (ESRO)

N74-22564*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
THERMAL PERFORMANCE OF MULTILAYER INSULATIONS Final Report
C. W. Keller, G. R. Cunnington, and A. P. Glassford 5 Apr. 1974 421 p refs
(Contract NAS3-14377)
(NASA-CR-134477; LMSC-D349866) Avail: NTIS HC $24.25 CSCL 20M

Experimental and analytical studies were conducted in order to extend previous knowledge of the thermal performance and gas evacuation characteristics of three selected multilayer insulation (MLI) composites. Flat plate calorimeter heat flux measurements were obtained for 20- and 80- shield specimens using three representative layer densities over boundary temperatures ranging from 39 K (70 R) to 389 K (700 R). Laboratory gas evacuation tests were performed on representative specimens of each MLI composite after initially purging them with helium, nitrogen, or argon gases. In these tests, the specimens were maintained at temperatures between 128 K (230 R) and 300 K (540 R). Based on the results of the laboratory-scale tests, a composite MLI system consisting of 112 unperforated, double-aluminized Mylar reflective shields and 113 water preconditioned silk net spacer pairs was fabricated and installed on a 1.22-m-(4-ft-) diameter calorimeter tank. Author

N74-22565# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
AN EXPERIMENTAL METHOD FOR SPRAY EVAPORATION STUDIES Mechanical Engineering Report
J. K. S. Wong Mar. 1973 117 p refs
(NRC-13306; MP-61) Avail: NTIS HC $9.00 CSCL 20M

A concept for the investigation of fuel spray evaporation from a phenomenological approach is introduced. This concept is based upon the physically observed fact that when a liquid spray evaporates in a closed high temperature environment, the temperature of the environment will decrease. The total amount of heat transferred to the fuel at any time is governed by the characteristics of the spray, and the heat and mass transfer processes of the system. This heat transfer determines the amount of fuel evaporated, and the states of the fuel and its vapor at that time. These in turn are functions of certain physical and thermodynamic properties of the fuel. Therefore, if the total heat loss of the environment can be measured, the amount of fuel evaporated can be estimated. From this, some spray evaporation characteristics may be predicted. Author

N74-22566*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASUREMENT OF GASEOUS EMISSIONS FROM A TURBOFAN ENGINE AT SIMULATED ALTITUDE CONDITIONS
Larry A. Diehl and James A. Biaglow Washington Apr. 1974 22 p refs
(NASA-TM-X-3046; E-7821) Avail: NTIS HC $3.00 CSCL 21E

Gaseous emission from a TFE 731-2 turbofan engine were measured over a range of fuel-air ratios from idle to full power at simulated from near sea level to 13,200 m. Carbon monoxide and unburned hydrocarbon emissions were highest at idle and lowest at high power settings; oxides of nitrogen exhibited the reverse trend. Carbon monoxide and unburned hydrocarbon levels decreased with increasing altitude. Oxides of nitrogen emissions were successfully correlated by a parametric group of combustor operating variables. Author

N74-22567*# Rocketdyne, Canoga Park, Calif.
ANALYSIS OF THE EFFECTS OF BAFFLES ON COMBUSTION INSTABILITY Final Report, Apr. 1971 - Mar. 1974
C. L. Oberg, W. H. Evers, M. D. Schuman, and A. L. Huebner May 1974 41 p refs
(Contract NAS3-11226)
(NASA-CR-134614; R-9480) Avail: NTIS HC $5.25 CSCL 21B

An analytical model has been developed for predicting the effects of baffles on combustion instability. This model has been developed by coupling an acoustic analysis of the wave motion within baffled chambers with a model for the oscillatory combustion response of a propellant droplet developed by Heidmann. A computer program was developed for numerical solution of the resultant coupled equations. Diagnostic calculations were made to determine the reasons for the improper prediction. These calculations showed that the chosen method of representing the combustion response was a very poor approximation. At the end of the program, attempts were made to minimize this effect but the model still improperly predicts the stability trends. Therefore, it is recommended that additional analysis be done with an improved approximation. Author

N74-22568*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HEAT TRANSFER TO SURFACE AND GAPS OF RSI TILE ARRAYS IN TURBULENT FLOW AT MACH 10.3
David A. Throckmorton Apr. 1974 100 p
(NASA-TM-X-71945) Avail: NTIS HC $4.00 CSCL 20M

Heat transfer to gap walls and surface of a simulated reusable surface insulation (RSI) tile array are presented. The data were obtained in the thick, turbulent tunnel wall boundary layer of the Langley Continuous Flow Hypersonic Tunnel at a freestream Mach number of 10.3 and a freestream unit Reynolds number of one million. Pertinent test variables were: (1) tile array orientation (staggered and in-line), (2) gap width, (3) flow angularity, and (4) tile mismatch. Author

N74-22569*# Dynatherm Corp., Cockeysville, Md.
HEAT PIPE DESIGN HANDBOOK, PART 1
E. A. Skrabek Aug. 1972 331 p refs
(Contract NAS9-11927)
(NASA-CR-134264; DTM-72-3-Pt-1; DRL-2-Pt-1) Avail: NTIS HC $19.75 CSCL 20M

The development and characteristics of heat pipes are examined. The subjects discussed are: (1) principles of operation, (2) heat pipe theory, (3) pressure gradient effects, (4) variable conductance, (5) design procedure, and (6) performance limit evaluation. Author

N74-22570*# Michigan Univ., Ann Arbor. Gas Dynamics Labs.
TWO PHASE DETONATION STUDIES Final Report, 1 Feb. 1973 - 1 Feb. 1974
J. A. Nicholls, T. H. Pierce, H. Miyajima, R. Oza, and P. Patil May 1974 98 p refs
(Grant NGL-23-005-336)
(NASA-CR-134623; UM-026030-5-F) Avail: NTIS HC $8.00 CSCL 21B

An experimental study of the passage of a shock wave over a burning fuel drop is described. This includes high speed framing photographs of the interaction taken at 500,000 frames per second. A theoretical prediction of the ignition of a fuel drop by a shock wave is presented and the results compared with earlier experimental work. Experimental attempts to generate a detonation in a liquid fuel drop (kerosene)-liquid oxidizer drop (hydrogen peroxide)-inert gas-environment are described. An appendix is included which gives the analytical prediction of power requirements for the drop generator to produce certain size drops at a certain mass rate. A bibliography is also included which lists all of the publications resulting from this research grant. Author

N74-22571*# Tennessee Technological Univ., Cookeville. Dept. of Mechanical Engineering.
AN INVESTIGATION OF THE OPEN-LOOP AMPLIFICATION OF A REYNOLDS NUMBER DEPENDENT PROCESS BY WAVE DISTORTION Semiannual Status Report, Jun. - Dec. 1973
Marie B. Ventrice and Kenneth R. Purdy May 1974 182 p refs
(Grant NGR-43-003-015)
(NASA-CR-134620) Avail: NTIS HC $12.25 CSCL 21B

The response of a constant-temperature hot-wire anemometer to sinusoidal and distorted sinusoidal acoustic oscillations is examined. The output of the anemometer is dependent upon the Reynolds number of the flow over the wire. The response is a measure of the interaction between the anemometer output and the acoustic pressure in the neighborhood of the wire. It is an open-loop prediction of the characteristics of actual closed-loop operation of a system. If the open-loop response is large enough, unstable closed-loop operation is predicted. The study was motivated by a need to investigate the stability limits of liquid-propellant rockets when perturbed by pressure oscillations. The sinusoidal and distorted sinusoidal acoustic oscillations used for this study are the same as those characteristic of unstable rocket combustion. Qualitatively, the results are similar--the response of the system to pure sinusoidal acoustic vibration of the fluid surrounding the wire is small, even when the magnitude of the acoustic pressure is quite large; but the response can be increased by as much as an order of magnitude with respect to the sinusoidal case by the addition of distortion. The amplitude and phase of the distortion component, relative to the fundamental component, are the dominant factors in the increase in the response. Author

N74-22572# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
EQUATIONS OF TURBULENT COMBUSTION. PART 2: BOUNDARY LAYER APPROXIMATION
K. N. C. Bray Oct. 1973 70 p refs
(Contract SRC-B/RC/3552)
(AASU-331) Avail: NTIS HC $6.50

An order of magnitude analysis is applied to the exact, time averaged equations of turbulent, chemically reacting flow within a two-dimensional, premixed turbulent flame at low Mach number

and high Reynolds number. Simplified time averaged equations are proposed, including the balance equations for mass, momentum, energy, species, turbulence kinetic energy, fluctuation intensities of thermodynamic variables, and composition covariances. The simplified equations contain reaction rate dependent terms and other terms which were not apparent in turbulent combustion modelling studies. Author (ESRO)

N74-22573# European Space Research Organization, Paris (France).
DETERMINATION OF THE THERMOGASDYNAMIC CORRELATION BETWEEN SHOCK-FRONT ANGLE AND HEAT ADDITION IN OBLIQUE COMPRESSION SHOCK
N. Schmidt (DFVLR, Brunswick) and M. Kallergis (DFVLR, Brunswick) Mar. 1974 44 p refs Transl. into ENGLISH of Zur Ermittlung des Thermogasdyn. Zusammenhangs Zwischen Stossfrontwinkel und Waermezufuhr im Schraegen Verdichtungsstoss, DLR-FB-73-21, DFVLR, 1973
(ESRO-TT-28; DLR-FB-73-21) Avail: NTIS HC $5.25; Original report in GERMAN: DFVLR, Porz, West Ger. 11.50 DM

The effects of heat addition in oblique compression shock on the thermodynamic, gas dynamic and geometric quantities are determined and presented graphically in the form of a parametric study. In particular, a method is described for determining shock front angle, which can only be implicit, on the basis of given incident flow Mach number, heat generation, and flow line deflection. The range of the physically possible sets of parameter values is shown in a synoptic diagram. Boundary lines divide the overall field into high and low solution areas for density jump and into weak and strong shock areas.
Author (ESRO)

N74-22574# ARO, Inc., Arnold Air Force Station, Tenn.
COMPARISON OF THREE TECHNIQUES FOR SOLVING THE RADIATIVE TRANSPORT EQUATION Final Report, 1 Aug. 1972 - 31 Jul. 1973
J. A. Roux and A. M. Smith AEDC Jan. 1974 42 p refs Sponsored by ARO
(AD-774023; ARO-VKF-TR-73-137; AEDC-TR-73-200) Avail: NTIS CSCL 20/13

The source function formulation of the radiative transport equation is solved by successive approximations; the discrete ordinate formulation is solved by both the Milne predictor-corrector and Chandrasekhar techniques. These three techniques are compared with respect to applicability and computation time, and a brief error analysis is given for each. A comparison is shown between the double and single Gaussian quadratures (orders 10 through 96) used in the discrete ordinate formulation. The effect of refractive index on the quadrature order necessary to obtain accuracy for Fresnel boundaries is shown.
Author (GRA)

N74-22575# Wisconsin Univ., Madison. Mathematics Research Center.
SOME SUPERCONVERGENCE RESULTS FOR AN (H SUP 1)-GALERKIN PROCEDURE FOR THE HEAT EQUATION Technical Summary Report
Jim Douglas, Jr., Todd Dupont, and Mary Fanett Wheeler Dec. 1973 26 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-774249; MRC-TSR-1382) Avail: NTIS CSCL 20/13

Thomee and Wahlbin have introduced a Galerkin method for the heat equation in a single space variable based on the (H sup 1) -inner product and have obtained (H sup 2) and (H sup 1) estimates for the error. An (L sup 2) estimate is given here. The main object is to show knot superconvergence phenomena when the subspace is a piecewise-polynomial space. For (C sup 2)-piecewise-polynomials of degree r, the error in the knot values is O(h sup(2r-2)); for the (C sup 1) case, both knot values and knot first x-derivatives are approximated to within O(H sup(2r-2)). Author (GRA)

N74-22576# Naval Weapons Center, China Lake, Calif.
APPLICATION OF COMBUSTION INSTABILITY RESEARCH
E. W. Price Jan. 1974 27 p
(AD-775289; NWC-TP-5603) Avail: NTIS CSCL 21/2

Combustion instability is described in both technical terms and in terms of problems posed in development programs and what constitutes solution of the problems. The nature of research results and impediments to application are described (both technical and administrative impediments). Successful applications of research are described, applications ranging from advance recognition of high risk situations to problem diagnosis, fix and quality control in development and production motors. Finally, problems and recommendations regarding future research and application are described, including both technical and management (system planning) aspects of the problem. Author (GRA)

N74-22577# McGill Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
THE PROPAGATION OF NONIDEAL BLAST WAVES Interim Report
Christiane M. Guirao, John H. Lee, and Glen G. Bach Jan. 1974 36 p refs Presented at the Conf. on the Mech. of Explosion and Blast Waves, Yorktown, Va. 13-15 Nov. 1973
(Grant AF-AFOSR-2387-72; AF Proj. 9711)
(AD-775097; MERL-74-0187TR) Avail: NTIS CSCL 19/4

The propagation of non-ideal blast waves initiated by finite power density sources has been classified into three regimes. The early-time motion of a non-ideal blast reflects the characteristics of the energy-time profile of the particular initiation energy source. In the intermediate-time propagation regime, the flow field in the neighborhood of the shock front progressively forgets the non-idealities of the initiation source. In the late-time or asymptotic regime, the shock hydrodynamics of non-ideal blast waves approaches that of ideal blasts with counterpressure effects. It is also found that energy scaling with respect to the explosion length exists for the present, non-ideal blast waves generated by an impulsive piston. Author (GRA)

N74-22578# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STATE-OF THE ART AND CERTAIN PROBLEMS IN THE THEORY OF COMBUSTION OF CONDENSED SYSTEMS
A. D. Margolin 1 Feb. 1974 21 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" Moscow, 1972 p 5-14
(AD-775114; FTD-MT-24-572-74) Avail: NTIS CSCL 21/2

The survey presents brief consideration of questions in the theory of the rate of combustion of homogeneous, heterogeneous, liquid, and two-phase systems which burn because of an internal oxidizer, along with questions of stability and regulation of combustion. GRA

N74-22579# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
BLAST HAZARDS OF CO/N2O MIXTURES Interim Report, Jan. - Sep. 1973
Charles R. Mastromonico Sep. 1973 54 p refs
(AF Proj. 317)
(AD-775158; AFPRL-TR-73-89) Avail: NTIS CSCL 19/4

A preliminary investigation into the explosion hazards associated with vapor and condensed phase mixtures of carbon monoxide (CO) and Nitrous Oxide (N2O) has been accomplished at the Air Force Rocket Propulsion Laboratory. Quantities of CO and N2O, ranging from 50 to 850 pounds, were combined in unconfined and semi-confined configurations and exploded using No. 8 blasting caps supported by a squib as the initiator. The configurations incorporated in the test matrix were designed to reproduce the variety of mixing modes that the two propellants would experience were they to escape, due to line or component failure, from a closed system into a test cell. Peak overpressures were measured as a function of time and distance from the explosion site. (Modified author abstract) GRA

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-22580 California Inst. of Tech., Pasadena. Environmental Quality Lab.
STATE POWER PLANT SITING: A SKETCH OF THE MAIN FEATURES OF A POSSIBLE APPROACH
James E. Krier, Lester Lees, and Daniel Dawes Feb. 1973 46 p refs
(EQL-Memo-4) Copyright. Avail: Issuing Activity

Work on various phases of power plant technology and siting was done within the Environmental Quality Laboratory (EQL) at the California Institute of Technology. The role of institutional aspects of the siting process is emphasized. Major outlines of one possible approach to power plant siting for the state are discussed. The approach to the siting plan is outlined with emphasis on the decision process involved in siting. The role of judicial review is discussed. State laws relating to the siting process are reviewed. A time line which summarizes the approach to the siting problem is presented. Author

N74-22581 California Inst. of Tech., Pasadena. Environmental Quality Lab.
ELASTICITY OF DEMAND FOR GASOLINE IN THE SOUTH COAST AIR BASIN
Alan M. Schneider 1973 18 p ref
(Grant NSF GI-29726)
(EQL-Memo-10) Copyright. Avail: Issuing Activity

An analysis of California gasoline sales was made, using Box and Jenkins' linear time series methods, in an attempt to detect the change due to a 17% change in price. There was no detectable change within the 2% noise limit of the method. Thus, either the elasticity is less than 2 parts in 17, and/or the tools must be further refined to detect it. Author

N74-22582 California Inst. of Tech., Pasadena. Environmental Quality Lab.
OUTLINE OF AN APPROACH TO MANAGEMENT STANDARDS
Kenneth Heitner and James E. Krier (Calif. Univ., Los Angeles) Jan. 1974 18 p
(Grant NSF GI-29726)
(EQL-Memo-13) Copyright. Avail: Issuing Activity

Management standards used as an approach to air quality nationwide are examined. The management concept is based on technical, economical, and social feasibility. Attempts will be made to reach a certain goal through a series of specified time phase steps. Each step would set a target date by which there must be achieved substantial percentage reductions in the number of days per year on which long term ambient air quality goal is violated, reducing this figure by the ultimate target date to no days of violation annually. Author

N74-22583 California Inst. of Tech., Pasadena. Environmental Quality Lab.
PUBLIC OPINION AND POLLUTION: AN INTERPRETIVE SURVEY
Morris P. Fiorina Jul. 1973 46 p refs
(Grant NSF GI-29726)
(EQL-Memo-9) Copyright. Avail: Issuing Activity

The feasibility of developing measures to insure environmental quality is discussed in terms of public opinion polls. Results of opinion polls regarding different environmental issues are presented. Some topics investigated are: the role of the environment in America's priorities; the amount Americans are willing to spend on preserving the environment; and the political implications of these public opinion data. S.K.W.

N74-22584*+ Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PUBLICATIONS OF THE JET PROPULSION LABORATORY, JANUARY - DECEMBER 1973
1 Apr. 1974 188 p refs
(Contract NAS7-100)
(NASA-CR-138171; JPL-Bibl-39-15) Avail: NTIS HC $12.50 CSCL 05B

Five classes of publications are included in this bibliography: (1) Technical Reports in which the information is complete for a specific accomplishment and is intended for a wide audience. (2) Articles from the bimonthly Deep Space Network Progress Report. Each volume's collection of articles presents a periodical survey of current accomplishments by the Deep Space Network. (3) Technical Memorandums, in which the information is complete for a specific accomplishment but is intended for a limited audience to satisfy unique requirements. (4) Articles from the JPL Quarterly Technical Review. Each article summarizes a recent important development, interim or final results, or an advancement in the state of the art in a scientific or engineering endeavor. This publication has been discontinued, and the issues indexed in this bibliography are the last to be published. (5) Articles published in the open literature. The publications are indexed by: (1) author, (2) subject, and (3) publication type and number. A descriptive entry appears under the name of each author of each publication; an abstract is included with the entry for the primary (first-listed) author. Author

N74-22585*# George Washington Univ., Washington, D.C. Technology Applications Group.
[NASA TECHNOLOGY UTILIZATION APPLICATIONS] Final Report, Sep. 1972 - Aug. 1973
Nov. 1973 160 p
(Contract NASw-2444)
(NASA-CR-138178) Avail: NTIS HC $11.00 CSCL 05B

The work is reported from September 1972 through August 1973 by the Technology Applications Group of the Science Communication Division (SCD), formerly the Biological Sciences Communication Project (BSCP) in the Department of Medical and Public Affairs of the George Washington University. The work was supportive of many aspects of the NASA Technology Utilization program but in particular those dealing with Biomedical and Technology Application Teams, Applications Engineering projects, new technology reporting and documentation and transfer activities. Of particular interest are detailed reports on the progress of various hardware projects, and suggestions and criteria for the evaluation of candidate hardware projects. Finally some observations about the future expansion of the TU program are offered. Author

N74-22586*# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
[A SUMMARY OF THE RESEARCH PROGRAM IN THE BROAD FIELD OF ELECTRONICS] Consolidated Semiannual Progress Report, 30 Sep. 1971 - 1 Apr. 1972
1 Apr. 1972 172 p refs Sponsored Jointly by NASA, HEW, AEC Calif. Inst. of Tech., the City of Los Angeles Dept. of Water and Power, and the Natl. Assoc. of Corrosion Engr.
(Grant AF-AFOSR-1622-69)
(NASA-CR-138121; SAPR-15) Avail: NTIS HC $11.75 CSCL 05B

Summary reports of research projects covering solid state materials, semiconductors and devices, quantum electronics, plasmas, applied electromagnetics, electrical engineering systems to include control communication, computer and power systems, biomedical engineering and mathematical biosciences. Author

N74-22587*# Stanford Research Inst., Menlo Park, Calif.
TECHNOLOGY TRANSFER: TRANSPORTATION Annual Report, 15 Aug. 1972 - 15 Aug. 1973
Tom Anyos, Ruth Lizak, and David Merrifield Sep. 1973 99 p refs
(Contract NASw-2455; SRI Proj. PYU-2201)
(NASA-CR-138180) Avail: NTIS HC $8.00 CSCL 15E

Standard Research Institute (SRI) has operated a NASA-sponsored team for four years. The SRI Team is concentrating on solving problems in the public transportation area and on developing methods for decreasing the time gap between the development and the marketing of new technology and for aiding the movement of knowledge across industrial, disciplinary, and regional boundaries. The SRI TAT has developed a methodology that includes adaptive engineering of the aerospace technology and commercialization when a market is indicated. The SRI Team has handled highway problems on a regional rather than a state basis, because many states in similar climatic or geologic regions have similar problems. Program exposure has been increased to encompass almost all of the fifty states. Author

N74-22588# Polytechnic Inst. of Brooklyn, N.Y. Microwave Research Inst.
[RESEARCH ON BASIC THEORETICAL PHYSICS, MATHE-

MATICS, ENGINEERING, AND MATERIAL AND DEVICE DEVELOPMENT] Progress Report, 15 Sep. 1972 - 14 Sep. 1973
Arthur A. Oliner Nov. 1973 420 p refs Sponsored in part by AROD and ONR
(Contract F44620-69-C-0047; AF Proj. 4751)
(AD-774747; PIBMRI-R-452.38-73; AFOSR-73-1979TR; PR-38) Avail: NTIS CSCL 05/2

The report summarizes research accomplished under the aegis of the Microwave Research Institute and reflects the impact of the Joint Services Electronics Program on the research activities of faculty and students of the Institute. The program covers a broad spectrum ranging from basic theoretical physics, mathematics, and engineering, to experimental investigations involving basic measurements, development of devices, and materials. The report is compiled under six headings: Electromagnetics and Waveguide Techniques; Quantum Electronics and Optics; Plasma Physics and Energy Conversion; Solid State and Materials; Communications and Computers; Systems, Control, and Network Theory. (Modified author abstract) GRA

N74-22589*# Scientific Translation Service, Santa Barbara, Calif.
SPACE INVESTIGATIONS: THEIR EFFECT ON SCIENCE AND TECHNOLOGY
N. Novokshchenov Washington NASA Apr. 1974 11 p Transl. into ENGLISH from Aviats. i Kosmonavtika (USSR), no. 1, 1974 p 36-37
(Contract NASw-2483)
(NASA-TT-F-15525) Avail: NTIS HC $4.00 CSCL 05B

A description is given of the 24th International Astronautics Congress held in Baku October 8 - 13, 1973. Brief summaries of the different reports presented are given. Author

N74-22590*# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.
COMPARATIVE EVALUATION OF SOLAR, FISSION, FUSION, AND FOSSIL ENERGY RESOURCES, PART 3 Final Report
J. D. Clement and W. A. Reupke 20 Mar. 1974 61 p refs
(Grant NGR-11-002-166)
(NASA-CR-138117) Avail: NTIS HC $6.25 CSCL 10B

The role of nuclear fission reactors in becoming an important power source in the world is discussed. The supply of fissile nuclear fuel will be severely depleted by the year 2000. With breeder reactors the world supply of uranium could last thousands of years. However, breeder reactors have problems of a large radioactive inventory and an accident potential which could present an unacceptable hazard. Although breeder reactors afford a possible solution to the energy shortage, their ultimate role will depend on demonstrated safety and acceptable risks and environmental effects. Fusion power would also be a long range, essentially permanent, solution to the world's energy problem. Fusion appears to compare favorably with breeders in safety and environmental effects. Research comparing a controlled fusion reactor with the breeder reactor in solving our long range energy needs is discussed. Author

N74-22591*# Tennessee Univ., Knoxville. Center for Business and Economic Research.
MEASURING AND MINIMIZING THE SOCIAL COST OF ENVIRONMENTAL POLLUTION Partial Final Report
Harold W. Henry 29 Jan. 1973 86 p
(Grant NGR-43-001-021)
(NASA-CR-138118) Avail: NTIS HC $7.50 CSCL 05K

The various impacts to the environmental protection movement on the largest corporations in several industries which had the most serious pollution problem are discussed. The purpose was to examine the impacts from the point of view of top corporation managers so that a broader perspective could be provided for all concerned parties- citizens, environmentalists, legislators, governmental administrators and agency personnel, scientists, engineers, and other industrial managers. Author

N74-22592# California Inst. of Tech., Pasadena. Environmental Quality Lab.
TRENDS OF ENERGY USE IN CALIFORNIA AND THE SOUTH COAST AIR BASIN
Paul K. Mazaika May 1973 58 p refs
(Grant NSF GI-29726)
(EQL-Memo-6) Avail: NTIS HC $6.00

A time history is presented of the major sources of energy described for 1969 in List's report, 'Energy Use in California'. As the data are compiled differently in these two reports, a comparison and interpretation is shown for 1969. The major difference is that his data are only for fuel used to provide energy within the state boundaries, while this report includes consumption for uses other than energy (LPG for chemical feedstock), and fuel used outside the state that was sold in the state (oil for ocean vessels). Natural gas delivered, gasoline, and LPG burned show good agreement. California's total electricity production agrees well. For the South Coast air basin, natural gas use agrees well between the two reports, while both gasoline use and electricity use are about 7% greater in the present work. Author

N74-22593# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 405
23 Apr. 1974 29 p Transl. into ENGLISH from various Eastern European reports
(JPRS-61817) Avail: NTIS HC $4.50

Articles concerning the development of and progress in theoretical and applied scientific disciplines and technical fields are presented. The administration, structure, personnel, and research plans of leading eastern European scientific organizations and institutions, particularly the academies of sciences is also discussed. Specific topics include computerized electronic design, nuclear power development, and ratio and television technology. Author

N74-22594# RAND Corp., Santa Monica, Calif.
PLANNING THEORY: AN EXAMINATION OF THE LINKAGES BETWEEN IMPLEMENTATION, KNOWLEDGE AND ACTION Ph.D. Thesis - Calif. Univ., Los Angeles
Nicki King Jan. 1974 20 p refs
(P-5161) Avail: NTIS HC $4.00

Urban planning theory is discussed with an emphasis upon incorporating more relevant considerations into the planning process. The need for planners to focus more attention on economic and political factors is emphasized. S.K.W.

N74-22595# RAND Corp., Santa Monica, Calif.
ENERGY ALTERNATIVES FOR CALIFORNIA: THE CURRENT CRISIS. 2: CONSERVATION OF ENERGY
Ronald D. Doctor Dec. 1973 34 p refs
(P-5156) Avail: NTIS HC $4.75

Methods for enacting energy conservation in California are discussed. Estimates are made of potential energy savings in the industrial, commercial, residential, and transportation sectors. It is recommended that the state government assume a more active role in allocating resources with particular attention to geographic and socioeconomic factors. S.K.W.

N74-22596# RAND Corp., Santa Monica, Calif.
ENERGY ALTERNATIVES FOR CALIFORNIA: THE CURRENT CRISIS. 3: ALLOCATION OF SCARCE SUPPLIES
Richard H. Ball Dec. 1973 21 p refs
(P-5157) Avail: NTIS HC $4.25

Projected allocations of scarce energy supplies for California are discussed. The state economy was divided into residential, commercial, industrial, and transportation sectors. Energy supplies discussed are: petroleum, electricity, natural gas, coal, and wood. Energy demand profiles are projected based on figures for demand in 1973. The role of government in allocating energy resources is discussed. S. K. W.

N74-22597# RAND Corp., Santa Monica, Calif.
PROBLEMS IN AVIONICS LIFE-CYCLE ANALYSIS
Marco R. Fiorello Dec. 1973 19 p refs Presented at 320 Mil. Operations Symp., 14-16 Nov. 1973
(P-5136) Avail: NTIS HC $4.00

The life-cycle costs of new generation avionics subsystems in contemporary weapon systems are discussed. These new avionics have high procurement costs, higher support costs and

even appear to dominate the weapon system maintenance costs. This report is concerned with the difficulties that characterize contemporary avionics life-cycle analysis. The uncertainty associated with estimating avionics life-cycle costs is related to the life-cycle stages of weapon systems. Specifically, the following areas are reviewed: (1) current avionics industry costing methods, (2) uncertainty in life-cycle cost modeling and estimating, (3) military cost data availability versus requirements, and (4) military institutional disincentives. Various recommendations are made to improve avionics life-cycle analysis. Author

N74-22598# RAND Corp., Santa Monica, Calif.
THE POLICY EFFECTS ANALYSIS METHOD: A SYSTEM DYNAMICS SIMULATION STUDY OF THE DEFENSE FUEL SUPPLY SYSTEM
James D. Steele Nov. 1973 18 p refs Presented at Conf. of the Operations Res. Soc. of Am., San Diego, Calif., 12-14 Nov. 1973
(P-5129) Avail: NTIS HC $4.00

A computerized simulation of military procurement policy for jet fuels and aviation gasoline is presented. The analysis is used to evaluate the effects of procurement policy on military operations. The effect of international and domestic energy policies on procurement is also discussed. S.K.W.

N74-22599*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SKYLAB-2 HANDHELD PHOTOGRAPHY ALPHABETIZED GEOGRAPHICAL FEATURES LIST
Jackye L. McNiel and C. C. DeValcourt Feb. 1974 69 p refs (Contract NAS9-12200)
(NASA-CR-134245; LEC-2059) Avail: NTIS HC $6.50 CSCL 05B

This publication represents a relisting of the Skylab-2, PTD Handheld Photography Catalog. The purpose of this publication is to provide imagery researchers a supplement to the PTD Catalog by alphabetically sorting together all similar major and minor features. Some cross-referencing of feature names was accomplished where the authors deemed necessary; however, no attempt was made to exhaust all possible means of cross-referencing. An example of the cross-referencing which was done: Kuril Islands may be found under the major feature column and also as a minor feature of Islands. Author

N74-22600# Committee on Science and Astronautics (U. S. House).
RESEARCH ON GROUND PROPULSION SYSTEMS
Washington GPO 1974 139 p ref Hearings on H.R. 10392 before Comm. on Sci. and Astronaut., 93rd Congr., 2d Sess., No. 26, 4-6 Feb. 1974
Avail: Subcomm. on Space Sci. and Appl.

Congressional hearings on a bill providing for more efficient ground propulsion systems are presented. Performance, efficiency, and environmental quality factors for propulsion systems are outlined. Plans for hydrogen engines are emphasized. S.K.W.

N74-22601# National Science Foundation, Washington, D.C. Office of Science Information Service.
THE GROWTH OF SCIENTIFIC AND TECHNICAL INFORMATION: A CHALLENGE
J. Georges Anderla (Paris Univ.) Jan. 1974 68 p refs
Avail: NTIS HC $6.50

Using a number of forecasting techniques, it is concluded that the volume, complexity, and growth rates of scientific and technical information have been grossly underestimated. By the middle part of the next decade it is estimated that the annual output of scientific and technical information may reach 12-14 million unduplicated items, compared to 2 million items now produced annually. By this reckoning the recent slowdown in the U.S. Production of scientific and technical information is more than offset by acceleration in the growth rates of such information throughout the rest of the world. Arguments that the sheer volume of this material will absolutely necessitate the use of sophisticated electronic information processing systems, and predictions that the present industry/service-dominated economy and society will be replaced by a new social order and structure which will be information oriented are presented. Reaction to this presentation was centered upon the definitional aspects of STI. Noting a lack of agreement on definition, it is concluded that the classification of information by categories is useful for analytical purposes; but for policy decisions, information must be treated as an entity. Author

N74-22602# Little (Arthur D.), Inc., Cambridge, Mass.
SOLAR HEATED AND COOLED OFFICE BUILDING FOR THE MASSACHUSETTS AUDUBON SOCIETY: INITIAL PLANNING AND DESIGN Final Report
Jun. 1973 58 p refs Prepared jointly with Cambridge Seven Assoc. Sponsored by Mass. Audubon Soc.
(C-75457) Avail: NTIS HC $6.00

A solar space conditioned office building is planned. The initial planning study consists of establishment of design criteria, preliminary engineering and architectural studies, planning for the design and construction phase, and estimation of design and construction costs and schedules. Author

N74-22603*# Georgia Inst. of Tech., Atlanta. Schools of Mechanical and Nuclear Engineering.
COMPARATIVE EVALUATION OF SOLAR, FISSION, FUSION, AND FOSSIL ENERGY RESOURCES. PART 4: ENERGY FROM FOSSIL FUELS Final Report
J. R. Williams [1974] 51 p refs
(Grant NGR-11-002-166)
(NASA-CR-138188) Avail: NTIS HC $5.75

The conversion of fossil-fired power plants now burning oil or gas to burn coal is discussed along with the relaxation of air quality standards and the development of coal gasification processes to insure a continued supply of gas from coal. The location of oil fields, refining areas, natural gas fields, and pipelines in the U.S. is shown. The technologies of modern fossil-fired boilers and gas turbines are defined along with the new technologies of fluid-bed boilers and MHD generators. K.M.M.

N74-22604*# Georgia Inst. of Tech., Atlanta. Schools of Mechanical and Nuclear Engineering.
COMPARATIVE EVALUATION OF SOLAR, FISSION, FUSION, AND FOSSIL ENERGY RESOURCES. PART 5: CONCLUSIONS AND RECOMENDATIONS Final Report
J. R. Williams [1974] 9 p refs
(Grant NGR-11-002-166)
(NASA-CR-138183) Avail: NTIS HC $4.00 CSCL 10B

Air pollution resulting from the use of fossil fuels is discussed. Phenomena relating to the emission of CO2 such as the greenhouse effect and multiplier effect are explored. Particulate release is also discussed. The following recommendations are made for the elimination of fossil fuel combustion products in the United States: development of nuclear breeder reactors, use of solar energy systems, exploration of energy alternatives such as geothermal and fusion, and the substitution of coal for gas and oil use. S.K.W.

N74-22605# Physikalischen Vereins, Frankfurt am Main (West Germany).
ANNUAL REPORT FROM THE PHYSICAL SOCIETY AT FRANKFURT AM MAIN FOR THE PERIOD FROM 1 JANUARY 1972 UP TO 31 DECEMBER 1972 147TH YEAR OF THE SOCIETY [JAHRESBERICHT DES PHYSIKALISCHEN VEREINS ZU FRANKFURT A. M. FUR DIE ZEIT VOM 1. 1. 1972 BIS ZUM 31. 12. 1972 147. VEREINSJAHR]
1973 137 p refs In GERMAN
Avail: NTIS HC $10.00

Research projects conducted by a physical sciences organization during calendar year 1972 are discussed. The subjects involved are: (1) problems and methods of time measurement, (2) determination of the age of meteorites, (3) physiological effects of radiation, (4) retinal photocoagulation from xenon lamps and laser radiation, and (5) benefits and harmful effects of electron beams on heart action. Yearly reports are included for an astronomical institute, a meteorological-geophysics institute, an institute for applied physics, and an institute for theoretical physics. Transl. by P.N.F.

N74-22606*# Kanner (Leo) Associates, Redwood City, Calif.
ESTABLISHMENT OF THE ACADEMY OF SCIENCES IN RUSSIA
B. V. Levshin Washington NASA May 1974 27 p refs

Transl. into ENGLISH from Priroda (Moscow), no. 1, Jan. 1974 p 6-24
(Contract NASw-2481)
(NASA-TT-F-15575) Avail: NTIS HC $4.50 CSCL 14B

A brief history of the development of science in the Soviet Union is presented. The period from the 17th Century to the present is covered. S.K.W.

N74-22607# RAND Corp., Santa Monica, Calif.
R AND D MANAGEMENT: METHODS USED BY FEDERAL AGENCIES
John G. Wirt, Arnold J. Lieberman, and Roger E. Levien Jan. 1974 278 p refs
(Contract HEW-OS-72-88)
(R-1156-HEW) Avail: NTIS HC $17.00

Methods are described which selected Federal agencies use to manage three major types of R and D: fundamental research to gain knowledge about basic natural phenomena; practice-oriented R and D to produce knowledge and products directly useful in practice; and programmatic R and D to solve important national problems in a comparatively short period of time. Included in the descriptions of the methods are (1) the procedures used for program management; (2) the organization of R and D activities within the various federal agencies; and (3) the staffing plans used to support R and D management. Author

N74-22608*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
SIGNATURE EXTENSION: AN APPROACH TO OPERATIONAL MULTISPECTRAL SURVEYS
R. F. Nalepka and J. P. Morgenstern Mar. 1973 75 p refs
(Contract NAS9-9784)
(NASA-CR-134254; ERIN-31650-152-T) Avail: NTIS HC $6.75 CSCL 05B

Two data processing techniques were suggested as applicable to the large area survey problem. One approach was to use unsupervised classification (clustering) techniques. Investigation of this method showed that since the method did nothing to reduce the signal variability, the use of this method would be very time consuming and possibly inacurrate as well. The conclusion is that unsupervised classification techniques of themselves are not a solution to the large area survey problem. The other method investigated was the use of signature extension techniques. Such techniques function by normalizing the data to some reference condition. Thus signatures from an isolated area could be used to process large quantities of data. In this manner, ground information requirements and computer training are minimized. Several signature extension techniques were tested. The best of these allowed signatures to be extended between data sets collected four days and 80 miles apart with an average accuracy of better than 90%. Author

N74-22609*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
EXTENSION OF ERIM MULTISPECTRAL DATA PROCESSING CAPABILITIES THROUGH IMPROVED DATA HANDLING TECHNIQUES Technical Report, 1 Nov. 1971 - 31 Jan. 1973
F. J. Kriegler Jun. 1973 28 p refs
(Contract NAS9-9784)
(NASA-CR-134268; ERIM-31650-158-T) Avail: NTIS HC $4.50 CSCL 05B

The improvement and extension of the capabilities of the Environmental Research Institute of Michigan processing facility in handling multispectral data are discussed. Improvements consisted of implementing hardware modifications which permitted more rapid access to the recorded data through improved numbering and indexing of such data. In addition, techniques are discussed for handling data from sources other than the ERIM M-5 and M-7 scanner systems. Author

N74-22610# Interior Dept., Washington, D.C.
UNITED STATES ENERGY FACT SHEETS, 1971
Feb. 1973 144 p
Avail: NTIS HC $10.25

Basic aspects of the nation's fuel-energy situation are outlined. Information for the individual states as well as regions is presented. Data from many different publications are consolidated with emphasis on basic facts and patterns about our fuel-energy picture from state and regional viewpoints. Energy Fact Sheet is a series of tables for the individual states. The tables summarizing the data for the various regions and the nation provide broad-scale comparisons. Several illustrations are included to portray some salient facts. The location of fuel reserves are shown on several maps. Author

N74-22611# Joint Publications Research Service, Arlington, Va.
COLLABORATION IN SPACE CONQUEST
Ye. Chugunov 3 May 1974 7 p Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 3, Mar. 1974 p 42-43
(JPRS-61908) Avail: NTIS HC $4.00

A review of international cooperation by the U.S.S.R. in space research is presented. Activities described include satellite, rocket and accompanying ground investigations, including fundamental problems in space physics, study of the structure and dynamics of the upper atmosphere and the ionosphere, investigation of solar short wave radiation and solar activity, the earth's magnetosphere, cosmic rays and particles of the radiation belts and the solid components of interplanetary matter. Author

N74-22612# Joint Publications Research Service, Arlington, Va.
U.S.S.R. ACADEMY OF SCIENCES PRESIDENT RECOUNTS 1973 ACHIEVEMENTS
M. V. Keldysh 1 May 1974 7 p Transl. into ENGLISH from Sots. Industr. (Moscow), no. 55, 6 Mar. 1974 p 1 and 3
(JPRS-61879) Avail: NTIS HC $4.00

Soviet achievements in science for 1973 are discussed. Topics include: space research, thermonuclear fusion, quantum electronics, catalytic processes, and molecular and biological genetics. S.K.W.

N74-22613*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN OVERVIEW OF THE NATIONAL SPACE SCIENCE DATA CENTER STANDARD INFORMATION RETRIEVAL SYSTEM (SIRS)
Arthur Shapiro, Sheldon Blecher (PMI Fac. Management Corp.), Ellen E. Verson (PMI Fac. Management Corp.), and Margaret L. King, ed. (PMI Fac. Management Corp.) May 1974 47 p
(NASA-TM-X-69903; NSSDC-74-09) Avail: NTIS HC $5.50 CSCL 05B

A general overview is given of the National Space Science Data Center (NSSDC) Standard Information Retrieval System. A description, in general terms, the information system that contains the data files and the software system that processes and manipulates the files maintained at the Data Center. Emphasis is placed on providing users with an overview of the capabilities and uses of the NSSDC Standard Information Retrieval System (SIRS). Examples given are taken from the files at the Data Center. Detailed information about NSSDC data files is documented in a set of File Users Guides, with one user's guide prepared for each file processed by SIRS. Detailed information about SIRS is presented in the SIRS Users Guide. Author

N74-22614*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NSSDC AND WDC-A-R AND S DOCUMENT AVAILABILITY AND DISTRIBUTION SERVICES
May 1974 29 p
(NASA-TM-X-69904; NSSDC/WDC-A-R/S-74-10) Avail: NTIS HC $4.50 CSCL 05B

The documents available from the National Space Science Data Center and the World Data Center A for Rockets and Satellites are described. The availability, costs, ordering procedures for documents presently available, and the procedures for obtaining future documents are given. Author

N74-22615# Los Alamos Scientific Lab., N.Mex.
ENERGY AND ENVIRONMENT: SYSTEM AND PERSPECTIVES
D. A. Freiwald Nov. 1973 13 p refs
(Contract W-7405-eng-36)
(LA-5447-MS) Avail: NTIS HC $4.00

The concept of energy and environment is discussed from

various perspectives, including space and time, energy systems development and natural resources, limits to growth, influence systems, the total environment, alternate schemes, and a communications structure. Brief discussions are presented as to how these subjects interrelate, and what types of programs might meaningfully ameliorate energy problems on a long-time scale.
Author (NSA)

N74-22616# Eurosat S.A., Geneva (Switzerland).
MANAGEMENT OF THE SPACE SEGMENT OF APPLICATION SATELLITE SYSTEMS
Sep. 1973 32 p
Avail: NTIS HC $4.75

The various fields of space applications in which Europe has shown an interest are briefly outlined. A methodical presentation of the various functions which are implied in the development and deployment of a satellite system destined to become operational, is made. These include technical-operational control of satellites, initiation of production and acceptance of replacement satellites, launching and orbit positioning of replacement satellites, and adaptation of existing ground facilities to the evolution of user's requirements. The role and preparation of Eurosat is also discussed. ESRO

N74-22617# Speas (R. Dixon) Associates, Manhasset, N.Y.
AIRLINE INDUSTRY FINANCIAL ANALYSIS WITH RESPECT TO AIRCRAFT NOISE RETROFIT PROGRAMS 1972-1978 Final Report, Aug. - Dec. 1972
Leroy Simpson, Robert C. Knowles, and Jack B. Feir Jan. 1973 68 p refs
(Contract DOT-OS-20088)
(PB-226278/0GA; OST-ONA-73-1) Avail: NTIS HC $3.50 CSCL 01C

The report examined the factors related to the financing of capital investments that would be required by the principal U.S. airlines to purchase and to install proposed noise reducing retrofit hardware on their JT-3D and/or JT-8D engined aircraft. The study identified the number of such turbo fan aircraft expected to be retrofit, the range of capital costs for three alternative retrofit programs, the relationship of such costs to total future airline financing requirements, and the variation of retrofit cost impact among carriers in the U.S. airline industry. The cost impact of retrofit was analyzed in relation to a forecast of the principal U.S. carriers' total future financing requirements financing requirements were analyzed in detail for four selected airlines. GRA

N74-22618# Office of Naval Research, London (England).
RESEARCH AND DEVELOPMENT AT THE ROYAL AIRCRAFT ESTABLISHMENT (RAE) AT FARNSBOROUGH AND BEDFORD, ENGLAND (RAE OPEN DAYS, 6-9 JUNE 1973)
Alfred E. Victor 15 Oct. 1973 14 p refs
(AD-774375; ONRL-R-27-73) Avail: NTIS CSCL 05/2

The Royal Aircraft Establishment has a public exhibition about every four years to display the research and development done there. A brief description of a number of the current projects that are being worked on is given to acquaint the United States research and development community with the RAE's main fields of interest, which possibly may stimulate bilateral dialogue leading to future cooperative efforts. Research is reported in the following areas: aeronautics, avionics, computing and data handling, electronic techniques and instrumentation, human factors in aircraft operation, materials, and weapons systems. GRA

N74-22619# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT Quarterly Report, 1 Oct. - 31 Oct. 1973
31 Dec. 1973 84 p refs
(AD-775537; DME/NAE-1973(3)) Avail: NTIS CSCL 20/4

Research is reported on bioengineering developments, the wind tunnel development of a low drag motorcycle, and the interaction of electromagnetic fields with birds. In addition current projects are noted on control systems, VTOL engines, flight research, fuels and lubricants, gas dynamics, high speed aerodynamics, hydraulics, instruments, low temperature characteristics, and marine dynamics. GRA

N74-22620# Council of State Governments, Washington, D.C.
STATE TRANSPORTATION ISSUE OF THE SEVENTIES, CONFERENCE SUMMARY
Richard Slavin, D. Joseph Smith, and H. Michael Dye Aug. 1973 66 p Conf. held at Baltimore, 28-29 Sep. 1972
(Contract DOT-OS-30022)
(PB-226319/2GA; DOT-OS-30022) Avail: NTIS HC $3.50 CSCL 13B

Through the cooperation of the U.S. DOT and the Council of State Governments, a conference on State Transportation Issues of the Seventies was held September 28 and 29, 1972, at the Friendship International Inn, in 1973 in Baltimore, Md., to assist the states in meeting their varied transportation problems. Participants at this conference included governors' respresentatives, state legislators, State Department of Transportation officials, and U.S. Department of Transportation officials. It was the hope of this meeting that better lines of communication would be established between the States and the U.S. DOT, as each endeavored to respond to the transportation needs of the Nation, their State and local communities. This publication reflects a summary of the main ideas and issues discussed during the meeting. GRA

N74-22621# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
APPLICATION OF REMOTE SENSORS TO ARMY FACILITY MANAGEMENT Final Report
Lewis E. Link, Jr. and John H. Shamburger Feb. 1974 172 p refs
(DA Proj. 4A6-32707-A-890)
(AD-775407; AEWES-TR-M-74-2) Avail: NTIS CSCL 15/5

A study was conducted to determine the feasibility of applying remote sensing techniques to Army needs for data in environmental monitoring, resource management, and master planning at multipurpose military installations in the continental United States. The environmental data requirements for these purposes were defined, and a general assessment was made of the applicability of current photographic, thermal infrared, and microwave imaging systems to obtain these data. Aerial photographic techniques were found to be the ones most generally applicable to acquisition of data relevant to basic environmental conditions. Prototype products, consisting of maps of basic environmental conditions, cultural features, and land use were produced from aerial photography of Fort Belvoir, Virginia, and a surrounding area. (Modified author abstract) GRA

N74-22622# Air Force Academy, Colo.
PROJECT POL (PETROLEUM, OIL, AND LUBRICANTS): OPTIMIZING PROCUREMENT OF AVIATION FUELS OR DEFENSE SUPPLY AGENCY Final Report
Larry M. Austin and William W. Hogan Jan. 1974 93 p refs
(AD-775053; USAFA-TR-74-2) Avail: NTIS CSCL 15/5

Defense Department requirements for aviation fuels are met with purchases made in the usual competitive bidding environment. This large-scale contract bidding and selection problem is modeled as a mixed integer linear program with a special structure. The solution of this large optimization problem is approached via an algorithm employing decomposition and implicit enumeration techniques which exploit the special structure of the underlying formulation. Computational results are discussed, and a FORTRAN computer program which implements the basic algorithm (POLKA) is exhibited. Author (GRA)

N74-22623# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
RESEARCH ON GENERAL PHYSICS, PLASMA DYNAMICS, AND COMMUNICATION SCIENCES AND ENGINEERING Progress Report period ending 31 Nov. 1973
H. J. Zimmermann, J. G. King, and S. J. Mason 15 Jan. 1974 150 p refs
(Contract DAAB07-71-C-0300)
(AD-774791; QPR-112) Avail: NTIS CSCL 05/2

Contents: Molecule microscopy, electron optics, physical electronics and surface physics, atomic resonance and scattering, quantum electronics, gravitation research, microwave and millimeter wave techniques, radio astronomy, electrodynamics of media, transport phenomena in solids, physical acoustics, plasma dynamics, processing and transmission of information, detection

and estimation theory, digital signal processing, speech communication, linguistics, cognitive information processing, communications biophysics, and neurophysiology. GRA